Chapter 5

Environmental Impacts

5. ENVIRONMENTAL IMPACTS

Chapter 5 describes the environmental consequences of the proposed action to relocate TA-18 capabilities and materials to either another location at Los Alamos National Laboratory or to Sandia National Laboratories/New Mexico, the Nevada Test Site, or Argonne National Laboratory-West. It also describes the environmental consequences of a No Action Alternative as well as the TA-18 Upgrade Alternative, under which TA-18 operations would continue at the Los Alamos National Laboratory TA-18 site. Site selection, affected environment, and environmental consequences associated with relocation of SHEBA and other security Category III/IV activities is presented as a separate analysis in this chapter. Chapter 5 also describes the environmental consequences of decontamination and decommissioning, impacts common to all alternatives, mitigation measures, and resource commitments.

5.1 INTRODUCTION

The environmental impacts analysis addresses all potentially affected areas in a manner commensurate with the importance of the effects on each area. The methodologies used for preparing the assessments for the following resource areas are discussed in Appendix F of this environmental impact statement (EIS): land resources; site infrastructure; air quality; noise; geology and soils; water resources; ecological resources; cultural and paleontological resources; socioeconomics; and waste management. The methodologies used to assess the human health effects from normal operations, facility accidents, and transportation are presented in Appendices B, C, and D, respectively. The environmental justice methodology is presented in Appendix E.

With the exception of the No Action Alternative, all alternatives would involve various degrees of construction activities. All construction would take place on land already owned by the Federal Government and administered by the U.S. Department of Energy (DOE) and, for a number of alternatives, on land that has already been disturbed by other DOE activities. This *Final Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory* (*TA-18 Relocation EIS*) addresses in detail the effects usually associated with land disturbance that construction activities would have on air and water resources and in lesser detail the effects on ecological, historical, cultural, and paleontological resources.

As indicated in Section 3.2.1, the normal operations activities under the proposed action would not be characterized by any significant release of effluent, radiological or nonradiological, hazardous or nonhazardous. Therefore, the effects on the health and safety of workers, the public, and the environment from normal facility operations are presented in detail in deference to public interest rather than an indication of their significance. This is also true of the assessments presented for socioeconomics, environmental justice, and waste generation.

The effects on the health and safety of workers, the public, and the environment from postulated accident conditions are presented in detail. The accidents selected for evaluation in this EIS are a subset of accidents that have been evaluated in detail and described in the *Basis for Interim Operations for the Los Alamos Critical Experiments Facility and Hillside Vault* (*TA-18 BIO*) (DOE 2001a). The accidents include a spectrum of events caused by fire, explosion, criticality, natural phenomena (i.e., earthquake), and external event (i.e., aircraft crash). DOE has considered impacts from sabotage in a separate analysis. This analysis is incorporated as a classified appendix to the EIS. Specific discussions associated with the

Radiological Health Effects Risk Factors Used in this EIS

Health impacts of radiation exposure, whether from external or internal sources, are generally identified as "somatic" (i.e., affecting the exposed individual) or "genetic" (i.e., affecting descendants of the exposed individual). Radiation is more likely to produce somatic effects (i.e., induced cancers) than genetic effects. Except for leukemia, which can have an induction period (time between exposure to carcinogen and cancer diagnosis) of as little as 2 to 7 years, most cancers have an induction period of more than 20 years. Because of the delayed effect, the cancers are referred to as "latent" cancers.

For a uniform irradiation of the body, the incidence of cancer varies among organs and tissues; the thyroid gland and skin demonstrate a greater sensitivity than other organs. Such cancers, however, also produce comparatively low mortality rates because they are relatively amenable to medical treatment. Because fatal cancer is the most probable serious effect of environmental and occupational radiation exposure, estimates of cancer fatalities, rather than cancer incidents, are presented in this EIS.

The number of latent cancer fatalities is estimated using risk factors determined by the International Commission on Radiological Protection. A risk factor is the probability that an individual would incur a latent cancer fatality during his or her lifetime if the individual receives a unit of radiation dose (1 rem). The risk factor for workers would be 0.0004 (latent cancer fatalities per rem) and 0.0005 (latent cancer fatalities per rem) for individuals among the general public. The risk factor for the public would be slightly higher because the public includes infants and children, who are more sensitive to radiation than adults.

Examples:

> The latent cancer fatality risk for an individual (nonworker) receiving a dose of 0.1 rem would be 0.00005 (0.1 rem × 0.0005 latent cancer fatalities per rem). This risk can also be expressed as 0.005 percent chance or 1 chance in 20,000.
>
> The same concept is used to calculate the latent cancer fatality risk from exposing a group of individuals to radiation. The latent cancer fatality risk for individuals in a group of 100,000, each receiving a dose of 0.1 rem, would be 0.00005, as indicated above. This individual risk, multiplied by the number of individuals in the group, expresses the number of latent cancer fatalities that could occur among the individuals in the group. In this example, the number would be 5 latent cancer fatalities (100,000 × 0.00005). A number of latent cancer fatalities less than 1 means that the radiation exposure is not sufficient to cause a single latent cancer fatality among the members of the group. In this case, the risk is expressed as a probability that a single latent cancer fatality would occur among the members of the group. For example, 0.05 latent cancer fatalities can be stated as "there is 1 chance in 20 (1/0.05) that 1 latent cancer fatality would occur among the members of the group."

The EIS provides estimates of probability of a latent cancer fatality occurring for the involved and noninvolved workers, the maximally exposed offsite individual, an average individual, and the general population. These categories are defined as follows:

Involved worker—An individual worker participating in the operation of the facilities

Noninvolved worker—An individual worker at the site other than the involved worker

Maximally exposed offsite individual—A hypothetical member of the public residing at the site boundary who could receive the maximum dose of radiation or exposure to hazardous chemicals

Average individual—A member of the public receiving an average dose of radiation or exposure to hazardous chemicals

Population—Members of the public residing within an 80-kilometer (50-mile) radius of the facility.

descriptions of the critical assembly machines for the relocation of the TA-18 missions as well as the assumptions used for the health and safety impact assessments are presented in appendices as follows:

Appendix A, Critical Assembly Descriptions
Appendix B, Human Health Effects from Normal Operations
Appendix C, Human Health Effects from Facility Accidents
Appendix D, Human Health Effects from Transportation
Appendix E, Environmental Justice

Chapter 5 is organized by major sections devoted to each site. Section 5.2 discusses the environmental consequences at the Los Alamos National Laboratory (LANL). LANL is involved in the No Action Alternative, the TA-18 Upgrade Alternative, and the LANL New Facility Alternative. The section includes discussion of impacts on all environmental resources for these three alternatives, impacts due to intersite transportation, and cumulative impacts at LANL. Sections 5.3, 5.4, and 5.5 discuss the environmental consequences of relocating TA-18 capabilities and materials to Sandia National Laboratories/New Mexico (SNL/NM), the Nevada Test Site (NTS), and Argonne National Laboratory-West (ANL-W), respectively. In addition to the discussion of construction and operations impacts on all environmental resources associated with each site, each section includes the impacts from transportation activities from LANL to the respective relocation site and the potential cumulative impacts that could result at each of these sites.

Additional sections in Chapter 5 present issues and impacts common to all or some of the alternatives. These sections include:

Section 5.6 Relocation of SHEBA and other security Category III/IV activities—Discusses the relocation of the TA-18 Solution High-Energy Burst Assembly (SHEBA) and other security Category III/IV activities. As discussed in Section 3.2, these TA-18 activities would not move out of LANL regardless of the alternative implemented for security Category I/II activities. Site selection, affected environment, options, and impacts associated with these activities are presented separately for convenience. The impacts are common and additive to each of the site alternatives except the No Action and the TA-18 Upgrade Alternatives.

Section 5.7 Decontamination and Decommissioning—Discusses generically and qualitatively the issue of decontamination and decommissioning for the existing TA-18 facilities after relocation and for the proposed new relocation facilities at the end of operations.

Section 5.8 Impacts Common to All Alternatives—Discusses impacts common to all alternatives in addition to those associated with SHEBA and security Category III/IV activities.

Section 5.9 Mitigation Measures—Discusses mitigation measures.

Section 5.10 Resource Commitments—Discusses, in general, the resource commitments required for the proposed action including unavoidable adverse impacts, the relationship between short-term and long-term use, and irreversible/irretrievable commitment of resources.

5.2 LANL ALTERNATIVES

This section presents a discussion of the environmental impacts associated with the No Action Alternative, the TA-18 Upgrade Alternative, and the LANL New Facility Alternative.

Under the No Action Alternative, the current operations at TA-18, involving all security Category activities, would be maintained at their current location in accordance with the Expanded Operations Alternative (Preferred Alternative) described in the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (LANL SWEIS)* (DOE 1999b) and associated Record of Decision (64 FR 50797). The No Action Alternative represents the status quo and would involve no new construction or any internal modifications other than those described in the *LANL SWEIS*.

Under the TA-18 Upgrade Alternative, the current operations at TA-18, involving all security Category activities, would remain at TA-18. Upgrade activities would involve internal modifications to existing facilities, infrastructure upgrades, and some new construction, as previously described in Section 3.3.2.

Under the LANL New Facility Alternative, the current operations at TA-18, involving all security Category activities except SHEBA, would be relocated to new buildings at TA-55 at LANL as previously described in Section 3.3.3. SHEBA would be relocated to new structures at LANL's TA-39.

The environmental impacts associated with the LANL alternatives are presented below for each environmental resource area. Environmental impacts associated with the relocation of SHEBA and security Category III/IV activities are discussed separately in Section 5.6. The Expanded Operations Alternative presented in the *LANL SWEIS* provides the baseline from which incremental effects of the proposed action at LANL are measured.

5.2.1 Land Resources

5.2.1.1 Land Use

No Action Alternative

Under the No Action Alternative, TA-18 operational capabilities and material storage would continue at the level described in the *LANL SWEIS*. Since no new buildings or facilities would be built and operations would not change, there would be no impact on land use at the site.

TA-18 Upgrade Alternative

Construction Impacts—With the exception of a new dome warehouse, all new facilities associated with this alternative would be built within the current TA-18 limited-area fence. The new dome warehouse would be built to the west of Building 30 and would require relocation of the limited-area fence. Construction of this facility would disturb about 0.2 hectares (0.5 acres) of previously cleared land. In addition to new construction, several existing structures would be modified. Both new construction and modifications to existing buildings required under this alternative would be compatible with the current land use at TA-18 and with its present Research and Development land-use designation (see Section 4.2.1.1).

Operations Impacts—Operations of new and upgraded facilities at TA-18 would be compatible with the current land use at TA-18, as well as its present land-use designation. Thus, there would be no impact on land use during the operational phase of the proposed action.

LANL New Facility Alternative

Construction Impacts—Under this alternative, a new below-grade critical assembly facility building and three new aboveground buildings (i.e., Central Utility Building, Low-Scatter Building, and Protected-Area Access-Control Building) would be constructed on 1.8 hectares (4.5 acres) of land. These new buildings would be located to the northwest of Plutonium Facility 4. Although use of the area for relocated TA-18 operations represents a change in land use of the area to be developed, its development is compatible with the area's current Research and Development land-use designation.

Operations Impacts—Operations of facilities at TA-55 would be compatible with current land use at TA-55, as well as its present land-use designation. Thus, there would be no impact on land use during the operational phase of the proposed action.

5.2.1.2 Visual Resources

No Action Alternative

Under the No Action Alternative, there would be no impact on visual resources at LANL or TA-18 since no new facilities would be built.

TA-18 Upgrade Alternative

Construction Impacts—Activities related to the construction of new buildings and building modifications required for the TA-18 Upgrade Alternative would result in a change to the visual appearance of the TA-18 area due to the presence of construction equipment and possibly increased dust. These changes would be temporary and, because of the isolated location of the area, would not be noticeable from any location beyond the LANL boundary. Thus, impacts on visual resources during construction would be minimal.

Operations Impacts—The new dome warehouse would slightly change the appearance of TA-18. However, this change would be consistent with current development in the area and, as noted above, would not be visible to the public from off site. Internal modifications to TA-18 structures would not result in any change to the appearance of the site. Thus, neither new construction nor modifications at TA-18 would change the current Class IV Bureau of Land Management Visual Resource Management rating of the area.

LANL New Facility Alternative

Construction Impacts—Under this alternative, a new below-grade critical assembly facility building and three new aboveground buildings would be constructed at TA-55. These facilities would be located to the northwest of Plutonium Facility 4. Construction impacts related to the presence of construction equipment and possibly increased dust would be temporary and generally would not be noticeable from off site.

Operations Impacts—New buildings would add to the visual impact of development at TA-55. However, the impact of the critical assembly facility building would be minimal since it would be built mostly underground. While not visible from lower elevations, new construction would be visible from higher elevations to the west along the upper reaches of the Pajarito Plateau rim. As a result of the Cerro Grande Fire, visibility of newly built structures (as well as the entire TA-55 area) would be greater than it would have been before the fire. However, regardless of the effects of the fire, the Class IV Bureau of Land Management Visual Resource Management rating of the area would not change as a result of implementation of this alternative.

5.2.2 Site Infrastructure

Annual site infrastructure requirements for current LANL operations as well as current site infrastructure capacities are presented in **Table 5–1**. These values provide the baseline for the LANL site infrastructure impact analyses presented hereafter in this section. The table also presents projected site infrastructure requirements that incorporate both the forecasted demands of the *LANL SWEIS* Expanded Operations Alternative and those of non-LANL users relying on the same utility systems. The *LANL SWEIS* identified that peak electrical demand could exceed site electrical capacity. In addition, whereas the *LANL SWEIS* had projected that water use would remain within DOE water rights, LANL now ultimately plans to permanently convey 70 percent of its water rights to Los Alamos County, lease the remaining 30 percent, and retain the right to purchase the leased percentage. As a result, site electric peak load and water capacities could also be exceeded at LANL in the future, even in the absence of new demands, should projected site requirements be realized. However, no infrastructure capacity constraints are anticipated in the near term, as LANL operational demands to date on key infrastructure resources (i.e., natural gas, water, and electricity) have been well below projected levels and well within the site capacities shown in Table 5–1. Also, no constraints in association with relocation of TA-18 operations are projected. DOE continues to evaluate options for increasing the reliability and availability of electric power to LANL (see Section 4.2.2.2) and purchase additional water from the county, if needed and available. Any potential shortfalls in available capacity would be addressed as increased site requirements are realized.

Table 5–1 Current and Projected Site Infrastructure Requirements for LANL Operations

Resource	*Site Capacity*	*Current Site Requirement* [a]	*Projected Site Requirement*	*Potential Exceeded Capacity*
Electricity [b]				
Energy (megawatt-hours per year)	937,000	475,868	876,000	0
Peak load (megawatts)	107	83	127	20
Fuel				
Natural gas (cubic meters per year)	229,400,000	70,000,000	81,600,000	0
Liquid fuels (liters per year) [c]	Not limited	Negligible	Negligible	0
Coal (metric tons per year)	Not applicable	0	0	0
Water (liters per year)	2,050,000,000 [d]	1,715,000,000	2,900,000,000	850,000,000

[a] Projected requirements over 25 years under the *LANL SWEIS* Expanded Operations Alternative (DOE 1999b). Revised projections for electrical energy, peak load, and natural gas also include usage for other Los Alamos County users that rely upon the same utility system (DOE 1999f).

[b] Electrical site capacity and current requirements are for the entire Los Alamos Power Pool, which includes LANL and other Los Alamos County users.

[c] Not limited due to offsite procurement.

[d] Equivalent to 30 percent of the water-right allocation from the main aquifer.

Source: Table 4–2, *TA-18 Relocation EIS*.

No Action Alternative

Projected site infrastructure requirements of TA-18 operations under the No Action Alternative are presented in **Table 5–2**. TA-18 operations consume a relatively small percentage of current available site capacities for electricity and water, with operations under the No Action Alternative essentially reflecting a continuation of current activities. Thus, the net impact on infrastructure is expected to be negligible.

TA-18 Upgrade Alternative

Construction Impacts—The projected demands on key site infrastructure resources associated with site construction under this alternative on an annual basis are presented in **Table 5–3**. Existing LANL infrastructure would easily be capable of supporting the construction requirements under the TA-18 Upgrade

Alternative without exceeding current site capacities. The electrical distribution and potable-water piping systems would be upgraded and replaced to better serve the upgraded facilities. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, it is expected that fuel would be procured from offsite sources and, therefore, would not be a limited resource. Impacts on the local transportation network are expected to be negligible.

Table 5–2 Annual Site Infrastructure Requirements for LANL Operations under the No Action Alternative

Resource	*Available Site Capacity* [a]	*No Action Alternative Requirement* [b]	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	461,132	2,836	0.6
Peak load (megawatts)	24	0.39	1.6
Fuel			
Natural gas (cubic meters per year)	159,400,000	200	0.0001
Liquid fuels (liters per year)[c]	Not limited	Negligible	Not limited
Coal (metric tons per year)	Not applicable	0	Not applicable
Water (liters per year)	335,000,000	14,650,000 [d]	4.4

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 5–1, *TA-18 Relocation EIS*.
[b] The No Action Alternative is a continuation of current TA-18 activities, and, therefore, associated infrastructure requirements are already accounted for in the "Available Site Capacity."
[c] Not limited due to offsite procurement.
[d] Estimated value.
Sources: Table 5–1, *TA-18 Relocation EIS*; LANL 2001a.

Table 5–3 Annual Site Infrastructure Requirements for Facility Construction under the TA-18 Upgrade and LANL New Facility Alternatives

Resource	*Available Site Capacity* [a]	*TA-18 Upgrade Alternative*		*LANL New Facility Alternative*	
		Requirement	*Percent of Available Site Capacity*	*Requirement*	*Percent of Available Site Capacity*
Electricity					
Energy (megawatt-hours per year)	461,132	187	0.04	128	0.03
Peak load (megawatts)	24	0.2	0.8	0.13	0.5
Fuel					
Natural gas (cubic meters per year)	159,400,000	0	0	0	0
Gasoline and diesel fuel (liters per year) [b]	Not limited	Negligible	Not limited	Negligible	Not limited
Water (liters per year)	335,000,000	2,900,000	0.9	17,000,000	5.1

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 5–1, *TA-18 Relocation EIS*.
[b] Not limited due to offsite procurement.
Sources: Table 5–1, *TA-18 Relocation EIS*; LANL 2001a.

Operations Impacts—Resources needed to support facility operations under the TA-18 Upgrade Alternative are presented in **Table 5–4**. Given current available site capacities, it is projected that existing LANL infrastructure resources would be adequate to support the proposed activities over 25 years.

LANL New Facility Alternative

Construction Impacts—It is projected that the existing LANL infrastructure would be capable of supporting construction requirements under the LANL New Facility Alternative on an annual basis without exceeding

current site capacities (see Table 5–3). Impacts on the local transportation network are expected to be negligible.

Operations Impacts—Resources needed to support operations under the LANL New Facility Alternative are presented in Table 5–4. It is projected that existing LANL infrastructure resources would be adequate to support proposed TA-18 activities over 25 years, based on current infrastructure demand.

Table 5–4 Annual Site Infrastructure Requirements for Facility Operations under the TA-18 Upgrade and LANL New Facility Alternatives

Resource	*Available Site Capacity* [a]	*TA-18 Upgrade Alternative*		*LANL New Facility Alternative* [b]	
		Requirement	*Percent of Available Site Capacity*	*Requirement*	*Percent of Available Capacity*
Electricity					
Energy (megawatt-hours per year)	461,132	2,836	0.6	21,000	4.6
Peak load (megawatts)	24	0.39	1.6	3	12.5
Fuel					
Natural gas (cubic meters per year)	159,400,000	200	0.0001	1,300,000	0.8
Liquid fuels (liters per year) [c]	Not limited	Negligible	Not limited	Negligible	Not limited
Coal (metric tons per year)	Not applicable	0	Not applicable	0	Not applicable
Water (liters per year)	335,000,000	14,650,000	4.4	6,900,000	2.1

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 5–1, *TA-18 Relocation EIS*.
[b] The actual net requirement for each resource would be the difference between that under the LANL New Facility Alternative minus that projected for the TA-18 Upgrade Alternative.
[c] Not limited due to offsite procurement.
Sources: Table 5–1, *TA-18 Relocation EIS*; LANL 2001a.

5.2.3 Air Quality

5.2.3.1 Nonradiological Releases

No Action Alternative

Under the No Action Alternative, small quantities of criteria and toxic air pollutants would continue to be generated from the burning of fuels (e.g., natural gas, propane, etc.) and other activities at TA-18. The emissions generated are considered part of the baseline concentrations (see Table 4–5). No increases in emissions or air pollutant concentrations are expected under the No Action Alternative. Therefore, a Prevention of Significant Deterioration increment analysis is not required (See Appendix F, Section F.3.1). In addition, LANL is located in an attainment area for criteria air pollutants; therefore, no conformity analysis is required (See Appendix F, Section F.3.2).

TA-18 Upgrade Alternative

Construction Impacts—Construction of new structures and modification of existing structures at TA-18 would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations for construction were modeled and compared to the most stringent standards (see **Table 5–5**). The maximum ground-level concentrations that would result from construction would be below the ambient air quality standards. The maximum short-term concentrations would occur at receptors on Pajarito Road adjacent to the construction area. The maximum annual concentrations would occur at a receptor to the east of TA-54 along the LANL boundary. Modeling of construction air quality

considered particulate emissions from activity in a construction area of 0.2 hectares (0.5 acres) and emissions from various earthmoving and material-handling equipment.

Table 5–5 Nonradiological Air Quality Concentrations at the Site Boundary under the TA-18 Upgrade Alternative – Construction

	Averaging Period	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 Hours 1 Hour	7,800 11,700	171 1,370
Nitrogen dioxide	Annual 24 Hours	73.7 147	0.242 73.9
PM_{10}	Annual 24 Hours	50 150	0.078 26.5
Sulfur dioxide	Annual 24 Hours 3 Hours	41 205 1,030	0.02 6.98 55.8
Total suspended particulates	Annual 24 Hours	60 150	0.138 46.5

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The National Ambient Air Quality Standards (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million. These values have been converted to micrograms per cubic meter with appropriate corrections for temperature (21° C [70° F]) and pressure (elevation 2,135 meters [7,005 feet]), following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The annual concentrations were analyzed at locations to which the public has access—the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

Sources: DOE 1999b, LANL 2001a.

Operations Impacts—Under the TA-18 Upgrade Alternative, small quantities of criteria and toxic air pollutants would continue to be generated from the burning of fuels such as natural gas and propane. The emissions are independent of the activities being performed at TA-18. The emissions are considered part of the baseline concentrations (see Table 4–5). No increases in air pollutant emissions or concentrations are expected under this alternative. Therefore, a Prevention of Significant Deterioration increment analysis is not required (see Appendix F, Section F.3.1). In addition, LANL is located in an attainment area for criteria pollutants; therefore, no conformity analysis is required (see Appendix F, Section F.3.2).

LANL New Facility Alternative

Construction Impacts—Construction of new buildings at TA-55 would result in an increase in air quality impacts from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations for construction were modeled and compared to the most stringent standards (see **Table 5–6**). The maximum ground-level concentrations that would result from construction would be below the ambient air quality standards, except for short-term concentrations of total suspended particulates which could be above the standard at receptors adjacent to the site along Pajarito Road. Actual construction concentrations are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The maximum short-term concentrations occur at a receptor on Pajarito Road adjacent to the construction area. The maximum annual concentrations would occur at a receptor to the north of TA-55 along the LANL boundary. Modeling of construction air quality considered particulate emissions from activity in a construction area of 1.8 hectares (4.5 acres) for security

Category I/II activities and emissions from various earthmoving and material-handling equipment. Mitigation measures that could be applied to construction activities are discussed in Section 5.9.

Table 5–6 Nonradiological Air Quality Concentrations at the Site Boundary under the LANL New Facility Alternative – Construction

	Averaging Period	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration from TA-55 (micrograms per cubic meter)* [b]
Carbon monoxide	8 Hours 1 Hour	7,800 11,700	30.3 132
Nitrogen dioxide	Annual 24 Hours	73.7 147	0.32 33
PM_{10}	Annual 24 Hours	50 150	1.98 129
Sulfur dioxide	Annual 24 Hours 3 Hours	41 205 1,030	0.029 3.31 24.8
Total suspended particulates	Annual 24 Hours	60 150	3.93 254

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The National Ambient Air Quality Standards (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million. These values have been converted to micrograms per cubic meter with appropriate corrections for temperature (21 °C [70 °F]) and pressure (elevation 2,135 meters [7,005 feet]), following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The annual concentrations were analyzed at locations to which the public has access – the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

Sources: DOE 1999b, LANL 2001a.

Operations Impacts—Under the LANL New Facility Alternative, criteria and toxic pollutants would be generated from the operation of the emergency diesel generators and other activities at TA-55. The emissions from the generators would be independent of the activities being performed at TA-55, since they result primarily from periodic testing. **Table 5–7** summarizes the concentrations of criteria pollutants from operation of the diesel generators. The concentrations are compared to their corresponding ambient air quality standards. The maximum ground-level concentrations that would result from operations would be below the ambient air quality standards, except for 24-hour standards for nitrogen dioxide. Actual operation concentrations are expected to be less because conservative stack parameters were assumed in the modeling of the diesel generator. The maximum annual concentrations would occur at a receptor to the north of TA-55 along the LANL boundary. The maximum short-term concentrations would occur at a receptor on Pajarito Road adjacent to TA-55. Mitigation measures that could be applied to operation activities are discussed in Section 5.9. No major change in emissions or air pollutant concentrations are expected under this alternative. Therefore, a Prevention of Significant Deterioration increment analysis is not required (see Appendix F, Section F.3.1). In addition, LANL is located in an attainment area for criteria air pollutants; therefore, no conformity analysis is required (see Appendix F, Section F.3.2).

5.2.3.2 Radiological Releases

No Action Alternative

Construction Impacts—There would be no radiological releases to the environment because this alternative would not involve any construction.

Table 5–7 Nonradiological Air Quality Concentrations at the Site Boundary under the LANL New Facility Alternative – Operations

	Averaging Period	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 Hours	7,800	682
	1 Hour	11,700	2,980
Nitrogen dioxide	Annual	73.7	0.061[c]
	24 Hours	147	668[c]
PM_{10}	Annual	50	0.002
	24 Hours	150	20.6
Sulfur dioxide	Annual	41	0.015
	24 Hours	205	166
	3 Hours	1,030	751
Total suspended particulates	Annual	60	0.002
	24 Hours	150	20.6

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The National Ambient Air Quality Standards (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million. These values have been converted to micrograms per cubic meter with appropriate corrections for temperature (21 °C [70 °F]) and pressure (elevation 2,135 meters [7,005 feet]), following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The annual concentrations were analyzed at locations to which the public has access – the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

[c] Actual concentration is expected to be less because conservative stack parameters were used in the modeling of diesel generator emissions.

Sources: DOE 1999b, LANL 2001a.

Operations Impacts—Approximately 110 curies per year of argon-41 would be released to the environment from operations of the TA-18 facilities at LANL. There would be no other radiological releases. Impacts from radiological releases are discussed in Section 5.2.10.1.

TA-18 Upgrade Alternative

Construction Impacts—While no radiological releases to the environment are expected in association with construction activities at TA-18, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contamination and would be required to remediate any contamination in accordance with procedures established under LANL's environmental restoration program and in accordance with LANL's Hazardous Waste Facility Permit.

Operations Impacts—Approximately 110 curies per year of argon-41 would be released to the environment from the operations of the TA-18 facilities at LANL. There would be no other radiological releases. Impacts from radiological releases are discussed in Section 5.2.10.1.

LANL New Facility Alternative

Construction Impacts—While no radiological releases to the environment are expected in association with construction activities at TA-55, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contamination and would be

required to remediate any contamination in accordance with procedures established under LANL's environmental restoration program and in accordance with LANL's Hazardous Waste Facility Permit.

Operations Impacts—Approximately 10 curies per year of argon-41 would be released to the environment from the operations of the relocated TA-18 capabilities at the new buildings in TA-55 (see Section 3.2.1). Impacts from radiological releases are discussed in Section 5.2.10.1.

5.2.4 Noise

No Action Alternative

Continuing operations at TA-18 would not involve any new construction, major changes in activities, or changes in employment levels. Thus, there would be no change in noise impacts on wildlife around the area or on the public under the No Action Alternative.

TA-18 Upgrade Alternative

Construction Impacts—Construction of new buildings and modification of facilities at TA-18 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of operation of construction equipment. There would be no change in noise impacts on the public outside of LANL as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments. Noise sources associated with construction at TA-18 are not expected to include loud impulsive sources such as blasting.

Operations Impacts—Noise impacts from operations of the upgraded TA-18 facilities are expected to be unchanged from existing operations at TA-18.

LANL New Facility Alternative

Construction Impacts—Construction of new buildings at TA-55 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of operation of construction equipment. There would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments. Noise sources associated with construction at TA-55 are not expected to include loud impulsive sources such as blasting.

Operations Impacts—Noise impacts from operations at the new buildings within TA-55 are expected to be similar to those from existing operations at TA-55. Although there would be a small increase in traffic and equipment noise (e.g., heating and cooling systems and generators) near the area, there would be little change in noise impacts on wildlife and no change in noise impacts on the public outside of LANL as a result of moving these activities to TA-55.

5.2.5 Geology and Soils

No Action Alternative

No additional impacts on geology and soils are anticipated at LANL beyond the effects of existing and projected activities independent of this proposed action. Hazards from large-scale geologic conditions, such

as earthquakes, and from other site geologic conditions with the potential to affect existing LANL facilities are summarized in Section 4.2.5 and further detailed in the *LANL SWEIS* (DOE 1999b).

TA-18 Upgrade Alternative

Construction Impacts—Construction associated with mission relocation activities under the TA-18 Upgrade Alternative is expected to disturb a total of approximately 0.2 hectares (0.5 acres) of land adjacent to existing facilities at the Pajarito site. Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-18, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. However, as blasting should not be necessary and the land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. A site survey and foundation study would be conducted as necessary to confirm site geologic characteristics for facility engineering purposes. The potential also exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's environmental restoration program and in accordance with LANL's Hazardous Waste Facility Permit.

As discussed in Section 4.2.5, LANL is located in a region of low to moderate seismicity overall. Ground shaking of Modified Mercalli Intensity VII (see Appendix F, Table F–6) associated with postulated earthquakes is possible and supported by the historical record for the region. Modified Mercalli Intensity VII would be expected to affect primarily the integrity of inadequately designed or nonreinforced structures, but damage to properly or specially designed or upgraded facilities would not be expected. Nevertheless, a capable fault (Rendija Canyon) is located about 5.5 kilometers (3.3 miles) northwest of TA-18. The potential for other large-scale geologic hazards to affect TA-18 facilities is generally low.

As stated in DOE Order 420.1, DOE is required to ensure that nuclear and nonnuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

Operations Impacts—The operations of TA-18 facilities under the TA-18 Upgrade Alternative would not be expected to result in impacts on geologic and soil resources at LANL. As discussed above, new, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1 and sited to minimize the risk from geologic hazards. Thus, site geologic conditions would not likely affect the facilities.

LANL New Facility Alternative

Construction Impacts—Construction associated with mission relocation activities under the LANL New Facility Alternative is expected to disturb a total of approximately 1.8 hectares (4.5 acres) of land northwest of Plutonium Facility 4 at TA-55. Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-18, but these resources are abundant in Los Alamos County. Relatively deep excavation would be required to construct below-grade portions of the critical assembly bays and material vaults, although no blasting is expected to be required. However, construction and excavation of volcanic tuff and overlying soils would have the potential to disturb contaminated media from a potential release site attributed to TA-48 activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's environmental restoration program and in accordance with LANL's Hazardous Waste Facility Permit.

Geologic hazards at LANL are discussed in detail in Section 4.2.5; the threat to LANL facilities is discussed previously for the TA-18 Upgrade Alternative. The Rendija Canyon Fault terminates approximately 1.3 kilometers (0.8 miles) northwest of TA-55. New facilities proposed under this alternative would be designed and constructed in accordance with applicable DOE orders and standards to ensure that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

Operations Impacts—The operations of the new facilities to support relocated TA-18 security Category I and II operational capabilities at TA-55 under this alternative would not be expected to result in impacts on geologic and soil resources at LANL. New facilities would be designed and constructed in accordance with applicable DOE orders and standards to minimize the risk from geologic hazards. Thus, site geologic conditions would be unlikely to affect the facilities over the 25-year operational life expectancy.

5.2.6 Water Resources

5.2.6.1 Surface Water

No Action Alternative

No additional impacts on surface water resources are anticipated at LANL under the No Action Alternative beyond the effects of existing and projected activities described in the Expanded Operations Alternative of the *LANL SWEIS* (DOE 1999b), which are independent of this proposed action.

TA-18 Upgrade Alternative

Construction Impacts—Surface water would not be used to support the construction of upgraded facilities at TA-18. Groundwater is the source of water at LANL. The Pajarito Canyon arroyo, which traverses the TA-18 complex, is not perennial and is not a viable source of surface water. Therefore, there would be no construction impact on surface water availability. Sanitary wastewater would be generated by construction personnel. As plans include the use of portable toilets, there would be no onsite discharge of sanitary wastewater and no impact on surface waters. Waste generation and management activities are detailed in Section 5.2.12.

Storm-water runoff from construction areas could potentially impact downstream surface water quality, although any effects on runoff quality would likely be localized around immediate points of disturbance or construction lay-down areas. However, appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) and spill prevention practices would be employed during construction to minimize suspended sediment and material transport and potential water quality impacts. As discussed in Section 4.2.6.1, TA-18 is located in a flood-prone area located at the confluence of the arroyos associated with Pajarito and Three Mile Canyons. DOE has recently completed a project to secure the TA-18 Pajarito site complex from flooding, including the installation of flood control and retention structures leading to an exceeding low likelihood that flooding would result in offsite contamination (LANL 2000c). The new buildings proposed for construction as part of this upgrade would be similarly protected and sited in accordance with applicable regulatory requirements and DOE orders (e.g., DOE Order 420.1), including Executive Order 11988, *Floodplain Management*.

Operations Impacts—No impacts on surface water resources are expected as a result of facility operations at TA-18 under this alternative. No surface water would be used to support facility activities and there would be no direct discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from facility staff use of lavatory, shower, and

break-room facilities and from miscellaneous potable and sanitary uses. Nevertheless, it is planned that this wastewater would be collected and conveyed by a new site sanitary sewer system for ultimate disposal via appropriate wastewater treatment facilities. In addition, no industrial or other National Pollutant Discharge Elimination System (NPDES)-regulated discharges to surface waters are anticipated, as there are no such discharges from current TA-18 facilities. Waste generation and management activities are detailed in Section 5.2.12. Also, the design and operations of new and modified facilities would incorporate appropriate storm-water management controls to safely collect and convey storm water from facilities while minimizing washout and soil erosion. Overall, operational impacts on site surface waters and downstream water quality would be expected to be negligible.

LANL New Facility Alternative

Construction Impacts—There are no natural surface water drainages in the vicinity of the TA-55 Plutonium Facility Complex and no surface water would be used to support facility construction. As previously discussed for the TA-18 Upgrade Alternative, it is expected that portable toilets would be used for construction personnel, resulting in no onsite discharge of sanitary wastewater and no impact on surface waters. Waste generation and management activities are detailed in Section 5.2.12.

Storm-water runoff from construction areas could potentially impact downstream surface water quality. Although construction activities could disturb up to 1.8 hectares (4.5 acres) of land northwest of Plutonium Facility 4 in TA-55, appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) and spill prevention practices would be employed during construction to minimize suspended sediment and material transport and potential water quality impacts. The TA-55 Plutonium Facility Complex is not in an area prone to flooding, and no floodplains are known to have been delineated in the immediate vicinity. Relocation of TA-18 operational capabilities and materials to this site would remove them from their current flood-prone area at TA-18.

Operations Impacts—No appreciable impacts on surface water resources are expected as a result of facility operations at TA-55 under this alternative for the same reasons as discussed for the TA-18 Upgrade Alternative.

5.2.6.2 Groundwater

No Action Alternative

No additional impacts on groundwater availability or quality are anticipated at LANL under the No Action Alternative beyond the effects of existing and projected activities described in the Expanded Operations Alternative of the *LANL SWEIS* (DOE 1999b), which are independent of this proposed action.

TA-18 Upgrade Alternative

Construction Impacts—Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and to meet the potable and sanitary needs of construction employees. Water use by construction personnel would be greatly reduced over that normally required by the proposed use of portable toilets. In addition, concrete and the water required for concrete mixing would likely be procured off site. As a result, it is estimated that construction activities would require approximately 2.9 million liters (766,000 gallons) of groundwater on an annual basis (see Table 5–3) to support facility upgrades and modifications. It is currently anticipated that this water would be derived from LANL groundwater supply sources via a temporary service connection or trucked to the point of use, especially during the early stages of construction. The relatively small volume of groundwater required

during the period of construction compared to site availability and historic usage indicates that construction withdrawals should not have an additional impact on regional groundwater levels or availability. Although construction dewatering is not expected to be required, perched groundwater bodies could potentially be encountered during site excavation of the canyon-bottom alluvium at TA-18. Excavation activities would not be expected to affect groundwater quality or flow.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls, countermeasures, and procedures would be employed to minimize the chance for petroleum, oils, lubricants, and other materials used during construction to be released to the surface or subsurface and to ensure that waste materials are properly disposed of. Waste generation and management activities are detailed in Section 5.2.12. In general, no impact on groundwater availability or quality is anticipated.

Operations Impacts—As is the case under the No Action Alternative, groundwater would continue to be used at TA-18 primarily to meet the potable and sanitary needs of facility personnel housed in upgraded facilities, as well as for miscellaneous building mechanical uses. It is estimated that TA-18 operations under this alternative would require about 14.6 million liters (3.86 million gallons) per year of groundwater (see Table 5–4). As this demand would be bounded by that required for existing TA-18 operations, which is a small fraction of total LANL usage, and would not exceed site availability, no additional impact on regional groundwater availability would be anticipated.

No sanitary or industrial effluent would be discharged to the surface or subsurface. Waste generation and management activities are detailed in Section 5.2.12. Thus, no operational impacts on groundwater quality would be expected.

LANL New Facility Alternative

Construction Impacts—Groundwater would be required to support construction activities as discussed for this alternative. It is estimated that construction activities under the LANL New Facility Alternative would require approximately 17 million liters (4.5 million gallons) of groundwater on an annual basis (see Table 5–3). Similar to the TA-18 Upgrade Alternative, the volume of groundwater required for construction would be small compared to site availability and historic usage, and there would be no onsite discharge of wastewater to the surface or subsurface. Also, appropriate spill prevention controls, countermeasures, and procedures would be employed to minimize the potential for releases of materials to the surface or subsurface. As a result, no impact on groundwater availability or quality is anticipated from construction activities in TA-55.

Operations Impacts—Buildings housing the relocated operations and activities at TA-55 under the LANL New Facility Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel, as well as for miscellaneous building mechanical uses. It is estimated that new building operations under this alternative would require about 6.9 million liters (1.8 million gallons) per year of groundwater. This demand is a small fraction of total LANL usage and would not exceed site availability (see Table 5–4). Therefore, no additional impact on regional groundwater availability would be anticipated.

No sanitary or industrial effluent would be discharged to the surface or subsurface. Waste generation and management activities are detailed in Section 5.2.12. Thus, no operational impacts on groundwater quality would be expected.

5.2.7 Ecological Resources

5.2.7.1 Terrestrial Resources

No Action Alternative

Under the No Action Alternative, impacts on terrestrial resources would not occur at TA-18 (or LANL), since no new facilities would be built and current facilities do not produce emissions or effluent of a quality or at levels that would likely affect wildlife.

TA-18 Upgrade Alternative

Construction Impacts—With the exception of a dome warehouse, all new facilities associated with this alternative would be built within the current TA-18 security fence and would not impact terrestrial resources at LANL. The new dome warehouse would be built to the west of Building 30 and would require relocation of the security fence. Construction would disturb about 0.2 hectares (0.5 acres) of previously cleared land; thus, no pinyon-juniper woodland would be disturbed by construction. This area is currently maintained as grassland.

Wildlife use of the new dome warehouse site is limited due to its small size, proximity to the security fence, and its grassland status. Noise associated with earthmoving activities and construction could cause temporary disturbance to wildlife found in areas adjacent to the construction site; however, such disturbance would be temporary. Since all activities would take place within a defined construction zone, direct human disturbance to wildlife and wildlife habitat outside of that zone, such as might be caused by the movement of equipment, would not occur.

Operations Impacts—Operations of facilities associated with TA-18 would not adversely impact either wildlife or wildlife habitat at the site under this alternative. Operations at upgraded TA-18 buildings and new buildings would not produce emissions or effluent of a quality or at levels that would likely affect wildlife.

LANL New Facility Alternative

Construction Impacts—Under this alternative, the construction of a new below-grade critical assembly facility building and three new aboveground buildings (i.e., Central Utility Building, Low-Scatter Building, and Protected-Area Access-Control Building) would disturb 1.8 hectares (4.5 acres) of land at TA-55. These new buildings would be located to the northwest of Plutonium Facility 4. The construction site is within the ponderosa pine forest vegetative zone of LANL. Since this area was burned at a low severity during the Cerro Grande Fire, some regeneration would be expected to occur by the time construction begins. Construction of new facilities would remove this regenerated vegetation and would preclude complete recovery of the ponderosa pine forest. However, the loss of 1.8 hectares (4.5 acres) of ponderosa pine forest represents a small percentage of this habitat type present within the immediate area or on LANL as a whole.

Wildlife using the site proposed for new buildings constructed under this alternative would be lost or displaced by construction. Once the new underground facility is complete, it would be covered with earth and revegetated with grasses. This could supply limited habitat; however, the species using the area would not be the same as those displaced by removal of the original ponderosa pine forest. Noise associated with earthmoving activities and construction could cause temporary disturbance to wildlife found in areas adjacent to the construction site; however, such disturbance would be temporary. Since all activities would take place within a defined construction zone, direct human disturbance to wildlife and wildlife habitat outside of that zone, such as might be caused by the movement of equipment, would not occur.

Operations Impacts—Operations of facilities associated with relocated TA-18 operational capabilities and materials would not be expected to impact either wildlife or wildlife habitat in the TA-55 area or LANL. Relocated TA-18 operations would not produce emissions or effluent of a quality or at levels that would likely affect wildlife.

5.2.7.2 Wetlands

No Action Alternative

Under the No Action Alternative, impacts on wetlands would not occur at TA-18 (or LANL), since no new construction would occur and would not be expected to undergo much change over the next 25 years.

TA-18 Upgrade Alternative

Construction and Operations Impacts—Construction and operations of new buildings under this alternative would not directly impact the one wetland located at the eastern end of TA-18. Further, erosion and sediment control measures would be undertaken during construction to ensure that indirect impacts would be avoided. Storm-water runoff and effluent discharge during operations would be expected to result in no adverse wetland impacts.

LANL New Facility Alternative

Construction and Operations Impacts—There are three wetlands located within TA-55 (see Section 4.2.7.2). None of these would be directly impacted by construction of the new buildings required to support relocated TA-18 operational capabilities and materials, and the implementation of proper erosion and sediment control measures during construction would prevent secondary impacts. During operations, storm-water runoff from the relocated TA-18 operations site would co-mingle with the storm-water runoff from the rest of TA-55. No direct or indirect adverse impacts on area wetlands is expected. Operational effluent discharge would not be produced of a quality or at levels that would adversely affect site area wetlands.

5.2.7.3 Aquatic Resources

No Action Alternative

Because no new buildings would be constructed under the No Action Alternative, and no aquatic resources are located at TA-18, no impacts on aquatic resources would occur at TA-18 (or LANL) from implementation of this alternative.

TA-18 Upgrade Alternative

Construction and Operations Impacts—There are no aquatic resources located at TA-18; thus, direct impacts on this resource would not occur under this alternative. Indirect impacts on aquatic resources located down-gradient from TA-18 would be prevented by implementation of appropriate erosion and sediment control measures during construction of new buildings. During operations, effluent discharge and storm-water runoff from TA-18 are not expected to result in either direct or indirect adverse impacts on area aquatic resources, as the quality and quantity of these should not undergo any changes.

LANL New Facility Alternative

Construction and Operations Impacts—There are no aquatic resources located at TA-55; thus, direct impacts on this resource would not occur from the implementation of this alternative. Indirect impacts on aquatic resources located down-gradient from TA-55 would be prevented by implementation of appropriate erosion and sediment control measures during construction activities. During operations, effluent discharge and storm-water runoff from the relocated TA-18 capabilities and materials at TA-55 would not be expected to result in any direct or indirect adverse impacts on area aquatic resources. The quantity of runoff and discharge would be a minor contribution to the watershed drainage downstream of TA-55.

5.2.7.4 Threatened and Endangered Species

No Action Alternative

Under the No Action Alternative, there would not be any impact on threatened and endangered species at LANL. Current TA-18 mission facilities do not produce any emissions or effluent that would likely affect any sensitive species that may occur at the site.

Upgrade Alternative

Construction Impacts—Impacts on threatened and endangered species resulting from implementation of the TA-18 Upgrade Alternative would be similar to that of the No Action Alternative, considering the activities at the facility would not change. Construction impacts would be minimal because the new construction would be on previously disturbed land, and vegetation cover at the construction sites is minimal.

Operations Impacts—Operations under this alternative would not impact threatened and endangered species because upgraded TA-18 mission facilities would not produce emissions or effluent of a quality or at levels that would likely affect these species.

LANL New Facility Alternative

Construction Impacts—Under the LANL New Facility Alternative, there would not be any adverse impacts expected on threatened and endangered species or their critical habitat due to construction. Sensitive species at TA-55 are found around the wetland areas, which would not be disturbed. In addition, the disturbance of approximately 1.8 hectares (4.5 acres) for construction of new buildings would be on previously disturbed sites. Under the *Los Alamos Threatened and Endangered Species Habitat Management Plan* (LANL 1998), surveys for threatened and endangered species would be completed prior to construction activities in areas where species may occur if land is disturbed; however, in the TA-55 developed area, this is not an issue.

Operations Impacts—Operations would not impact threatened and endangered species because relocated TA-18 operations would not produce emissions or effluent of a quality or at levels that would likely affect these species.

5.2.8 Cultural and Paleontological Resources

5.2.8.1 Prehistoric Resources

No Action Alternative

Under the No Action Alternative, there would be no facility modifications at TA-18, and operations would continue at the level described in the Expanded Operations Alternative of the *LANL SWEIS* (DOE 1999b). Since no new facilities would be built and operations would not change, there would be no impact on prehistoric resources at the site.

TA-18 Upgrade Alternative

Construction and Operations Impacts—Under this alternative, a new dome warehouse would be constructed outside of the current TA-18 security fence. All other new facilities associated with this alternative would be built within the current security fence. The new dome warehouse would be built to the west of Building 30 and would require relocation of the security fence. Construction would disturb about 0.2 hectares (0.5 acres) of land. In addition to new construction, several existing structures would be modified. Due to the disturbed nature of TA-18, impacts on prehistoric resources are unlikely to result from construction activities taking place within the security fence. However, the possibility exists that construction of the new dome warehouse could disturb previously unknown prehistoric resources. Prior to construction, a cultural resource survey would be conducted of the area to be disturbed. If prehistoric resources were discovered, during construction all work potentially affecting the resources would stop. This work stoppage would be followed by investigations by qualified cultural resource specialists; any coordination necessary with the State Historic Preservation Office; and development and implementation of measures to salvage these resources. Construction would not disturb the two known prehistoric sites located at TA-18 (see Section 4.2.8.1). Operations of TA-18 mission facilities would not affect prehistoric resources under this alternative.

LANL New Facility Alternative

Construction and Operations Impacts—Under this alternative, construction would disturb about 1.8 hectares (4.5 acres) of land to the northwest of Plutonium Facility 4. This area has not been surveyed for prehistoric resources and, therefore, prior to construction, a cultural resource survey would be conducted and site mitigations would be applied. As noted for the TA-18 Upgrade Alternative, if any such resources were located during construction, work would stop while appropriate action was taken. Construction would not disturb the one prehistoric lithic scatter known to be present at TA-55. Operation of relocated TA-18 capabilities at TA-55 would not affect prehistoric resources under this alternative.

5.2.8.2 Historic Resources

No Action Alternative

Under this alternative, there would be no facility modifications at TA-18, and operations would continue at the level described in the Expanded Operations Alternative of the *LANL SWEIS* (DOE 1999b). Since no new buildings would be constructed and operations would not change, there would be no impact on historic resources at the site.

TA-18 Upgrade Alternative

Construction and Operations Impacts—Neither new construction nor modifications to existing structures required to support the TA-18 Upgrade Alternative would be expected to adversely impact either the mule-train trail which runs through TA-18 or the Ashley Pond cabin. Also, building modifications would not be expected to affect the overall status of World War II and early cold-war-period structures at the site. However, these are historic structures that are potentially eligible for the National Register of Historic Places. Prior to the beginning of construction, a cultural resource survey, including historic building eligibility assessments, would be conducted both within the currently developed portion of the site and the area proposed for construction of the new dome warehouse. For those buildings determined to be eligible for the National Register, a Memorandum of Agreement would be prepared stating the measures required to resolve the adverse effects of building modification. These measures (which may include archival photography of buildings and equipment) would be completed prior to the start of modification activities at TA-18. Operations at TA-18 would not affect historic resources under this alternative.

LANL New Facility Alternative

Construction and Operations Impacts—This alternative would not impact the two historic sites located at TA-55 (see Section 4.2.8.2). Prior to the beginning of construction, a cultural resource survey would be conducted and site mitigation would be applied. Operations of relocated TA-18 capabilities and materials at TA-55 would not likely adversely affect historic resources under this alternative.

While there are no historic resource concerns with respect to TA-55, many of the buildings in TA-18 are historically significant and are potentially eligible for the National Register of Historic Places. Removing equipment and vacating buildings is considered an adverse effect to historic properties. Historic building eligibility assessments would be completed for all buildings in TA-18 and transmitted to the State Historic Preservation Office for concurrence. For those buildings determined to be eligible for the National Register, a Memorandum of Agreement would be prepared stating the measures required to resolve the adverse effects of removing equipment and vacating buildings. These measures (which may include archival photography of buildings and equipment, oral interviews with current or past site personnel, compiling building drawings, and preparing a detailed history) would be completed prior to the start of relocation activities at TA-18.

5.2.8.3 Native American Resources

No Action Alternative

Under this alternative, there would be no facility modifications at TA-18 and missions would continue at the level described in the Expanded Operations Alternative of the *LANL SWEIS* (DOE 1999b). Since no new facilities would be built and operations would not change, there would be no impact on Native American resources at the site.

TA-18 Upgrade Alternative

Construction and Operations Impacts—Modifications to existing structures required to support the TA-18 Upgrade Alternative would not adversely impact Native American resources. Although no such resources have been identified within the area proposed for the new dome warehouse, it is possible that the construction of this warehouse and a relocated security fence would impact Native American resources. Care would be taken during design to ensure that this would not happen. A cultural resources survey would be conducted prior to the beginning of construction of either the dome warehouse or the security fence. As noted in Section 5.2.8.1, if any Native American resources were located during construction, work would

stop while appropriate action was taken. Operations at TA-18 would not affect Native American resources under this alternative.

LANL New Facility Alternative

Construction and Operations Impacts—The area at TA-55 proposed to house security Category I/II activities has not been surveyed for Native American resources, and, therefore, prior to construction, a cultural resource survey would be conducted and site mitigations, if needed, would be applied. Similar to the process identified in Section 5.2.8.1 for prehistoric resources, if any Native American resources were located during construction, work would stop while appropriate action was taken. Operations of relocated TA-18 capabilities and materials at TA-55 would not affect Native American resources under this alternative.

5.2.8.4 Paleontological Resources

No Action Alternative

Since no new construction would occur and operations would not change, and, as stated in Section 4.2.8.4, no paleontological sites have been reported to occur within LANL boundaries, there would be no impact on paleontological resources at the site.

TA-18 Upgrade Alternative

Construction and Operations Impacts—No paleontological sites have been reported to occur within LANL boundaries; therefore, construction and operations of a new dome warehouse at TA-18 in connection with this alternative would not impact paleontological resources.

LANL New Facility Alternative

Construction and Operations Impacts—Construction and operations of new buildings under this alternative would not impact paleontological resources, since no such resources have been identified at LANL.

5.2.9 Socioeconomics

No Action Alternative

Under the No Action Alternative, the current employment of approximately 212 workers at TA-18 would continue. No new employment or in-migration of workers would be required. Therefore, there would be no additional impact on the socioeconomic conditions around LANL.

TA-18 Upgrade Alternative

Construction Impacts—Modifications and upgrades to the existing TA-18 facilities would require a peak construction employment level of 110 workers. This level of employment would generate about 312 indirect jobs in the region around LANL. The potential total employment increase of 422 direct and indirect jobs represents an approximate 0.5 percent increase in the workforce and would occur only over the 24 months of construction. It would have no noticeable impact on the socioeconomic conditions of the region of influence.

Operations Impacts—Current employment of approximately 212 workers at TA-18 would continue. No new employment would be required. Therefore, there would be no additional impact on the socioeconomic conditions around LANL.

LANL New Facility Alternative

Construction Impacts—Construction of new buildings at TA-55 to house security Category I/II activities would require a peak construction employment level of 300 workers. This level of employment would generate about 852 indirect jobs in the region around LANL. The potential total employment increase of 1,152 direct and indirect jobs represents an approximate 1.3 percent increase in the workforce and would occur over the 16 months of construction. It would have no noticeable impact on the socioeconomic conditions of the region of influence.

Operations Impacts—Current employment levels in support of relocated TA-18 capabilities and materials would continue. No new employment or in-migration of workers would be required. Therefore, there would be no additional impact on the socioeconomic conditions around LANL.

5.2.10 Public and Occupational Health and Safety

The assessments of potential radiological impacts associated with LANL alternatives are presented in this section. No chemical-related health impacts are associated with any of these alternatives because only very small quantities of industrial-type chemicals, such as ethanol, isopropyl alcohol, magnesium oxide, phenylphosphine, and xylene, would be used. As stated in the *LANL SWEIS* (DOE 1999b), the quantities of these chemicals that could be released to the atmosphere during normal operations are minor and would be below the screening levels used to determine the need for additional analysis. There would be no operational increase in the use of these chemicals as a result of the proposed action. No chemicals have been identified that would be a risk to members of the public from construction activities associated with any of the LANL alternatives. Construction workers would be protected from hazardous chemicals by adherence to Occupational Safety and Health Administration (OSHA) and U.S. Environmental Protection Agency (EPA) occupational standards that limit concentrations of potentially hazardous chemicals. The potential occupational (industrial) impacts on workers during construction and operations were evaluated based on DOE and Bureau of Labor Statistic data; and are detailed in Section C.7 of Appendix C. Construction and operations activities under these alternatives would be expected to result in some injuries, but no fatalities, to workers for the duration of the proposed action (i.e., about 3 years of construction and 25 years of operations).

Summaries of radiological impacts from normal operations and postulated accidents are presented below. The methodologies used to determine the impacts on the public and facility workers are presented in Appendix B. Supplemental information associated with normal operations and postulated accidents is provided in Appendices B and C, respectively.

5.2.10.1 Construction and Normal Operations

No Action Alternative

Construction Impacts—There would be no radiological or hazardous chemical impacts on members of the public or workers because this alternative would not involve any construction.

Operations Impacts—Under this alternative, the only radiological release would be 110 curies per year of argon-41 to the atmosphere (see Section 5.2.3.2). The associated calculated impacts on the public are

presented in **Table 5–8** for two types of receptors: the general public living within 80 kilometers (50 miles) of TA-18 and a maximally exposed offsite individual (a member of the public assumed to be residing at the LANL site boundary who receives the maximum dose). The only dose pathway for these receptors is from immersion in the passing plume. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Table 5–8 Annual Radiological Impacts on the Public from Operations at TA-18 Facilities under the No Action Alternative

Receptor	*Impact Values*		
	Security Category I/II Activities	***Security Category III/IV and SHEBA Activities*** [a]	***Total TA-18 Facilities***
Population within 80 Kilometers (50 Miles)			
Collective dose (person-rem)	0.0087	0.087	0.096
Percent of natural background radiation [b]	7.5×10^{-6}	7.5×10^{-5}	8.3×10^{-5}
Cancer fatalities [c]	4.4×10^{-6}	4.4×10^{-5}	4.8×10^{-5}
Maximally Exposed Offsite Individual			
Dose (millirem)	0.0061	0.061	0.067
Percent of regulatory dose limit [d]	0.061	0.61	0.67
Percent of natural background radiation [b]	0.0017	0.017	0.019
Cancer fatality risk [c]	3.1×10^{-9}	3.1×10^{-8}	3.4×10^{-8}
Average Individual within 80 Kilometers (50 Miles)			
Dose (millirem)	2.7×10^{-5}	2.7×10^{-4}	3.0×10^{-4}
Percent of natural background radiation [b]	7.5×10^{-6}	7.5×10^{-5}	8.3×10^{-5}
Cancer fatality risk [c]	1.4×10^{-11}	1.4×10^{-10}	1.5×10^{-10}

[a] Impacts on the public are principally from releases associated with SHEBA activities.
[b] The average annual dose from background radiation at LANL is 360 millirem (see Section 4.2.11.1); the 320,200 people living within 80 kilometers (50 miles) would receive an annual dose of 115,300 person-rem from the background radiation.
[c] Based on a cancer risk estimate of 0.0005 latent cancer fatalities per person-rem (see Appendix B).
[d] This comparison cannot be made for the population and average individual because there is no standard or limit.

As shown in the table, the expected annual radiation dose to the maximally exposed offsite individual member of the public would be much smaller than the limit of 10 millirem per year set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a latent cancer fatality to this individual from operations would be approximately 3.4×10^{-8} per year (i.e., about 1 chance in 29 million per year of a latent cancer fatality). The projected number of fatal cancers to the population within 80 kilometers (50 miles) would be 4.8×10^{-5} per year (i.e., about 1 chance in 20,000 per year of a latent cancer fatality).

As explained in Section 4.2.11.1 of the EIS, members of the public passing by the TA-18 facility along Pajarito Road could receive an external radiation dose from criticality experiment operations at TA-18. Based on radiation doses that have been measured along Pajarito Road, the road is closed to the public for any operation that could result in more than 4.75 millirem in any hour along the road. As a result, the maximum dose that a member of the public could receive from a single operation at TA-18 would be 4.75 millirem. A conservative estimate of the average number of times each year that an individual could be in a position to be exposed to this radiation level (based on 10 trips along Pajarito Road each day) is less than one (LANL 2001a). Therefore, the expected dose from direct radiation to the maximally exposed individual traveling on Pajarito Road is less than 4.75 millirem, and the risk of a latent fatal cancer from this dose is less than 2.4×10^{-6} per year.

Annual radiological doses to workers involved with TA-18 facility operations under this alternative are provided in **Table 5–9**.

As shown in the table, the annual doses to individual workers would be well below the DOE limit of 5,000 millirem (10 CFR 835) and the DOE recommended Administrative Control Level of 500 millirem (DOE 1999c). The projected number of fatal cancers in the workforce from annual operations would be 0.0085 (or 1 chance in 118 that the worker population would experience a fatal cancer per year of operations).

Table 5–9 Annual Radiological Impacts on LANL Workers from Operations at TA-18 Facilities under All LANL Alternatives

Receptor	*Impact Values*		
	Security Category I/II Activities	***Security Category III/IV and SHEBA Activities***	***Total TA-18 Facilities***
Individual Worker [a]			
Average worker dose (millirem)	100		
Average worker cancer fatality risk [b]	4.0×10^{-5}		
Worker Population [c]			
Collective dose (person-rem) [d]	10 [e]	11	21 [f]
Cancer fatality risk [b]	0.0040 [e]	0.0045	0.0085 [f]

[a] The average worker dose of 100 millirem and the average worker cancer fatality risk of 4.0×10^{-5} are applicable to all TA-18 activities. The regulatory dose limit for an individual worker is 5,000 millirem per year (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 millirem per year, as established in 10 CFR 835.1002. Further, DOE recommends that facilities adopt a more limiting 500-millirem-per-year Administrative Control Level (DOE 1999c). To reduce doses to levels that are as low as is reasonably achievable, an effective dose reduction plan would be enforced.

[b] Based on a cancer risk estimator of 0.0004 latent cancer fatalities per person-rem (see Appendix B).

[c] The Expanded Operations Alternative in the *LANL SWEIS* estimates that 212 workers (technical and security personnel) would be involved in the TA-18 facilities operations.

[d] The collective dose is based on an assumed workforce split of 100 persons for security Category I/II activities and 110 persons for security Category III/IV and SHEBA activities.

[e] Applicable to the LANL New Facility Alternative.

[f] Applicable to the No Action and TA-18 Upgrade Alternatives.

TA-18 Upgrade Alternative

Construction Impacts—No radiological risks would be incurred by members of the public from construction activities. Construction workers would be at a small risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site, including that associated with residual contamination at the facilities being upgraded. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as is reasonably achievable.

Operations Impacts—Under this alternative, the only radiological release would be 110 curies per year of argon-41 to the atmosphere (see Section 5.2.3.2). The calculated associated impacts on the public would be identical to the impacts shown for the No Action Alternative as described earlier in this section.

Similarly, annual radiological doses to workers involved with TA-18 facility operations under this alternative would be similar to the impacts described for the No Action Alternative. The annual doses to individual workers would be well below the DOE limit of 5,000 millirem (10 CFR 835); the DOE Control Level of 1,000 millirem per year as established in 10 CFR 835.1002; and the DOE recommended Administrative Control Level of 500 millirem (DOE 1999c). The projected number of fatal cancers in the workforce from annual operations would be 0.0085 (or 1 chance in 118 that the workers would experience a fatal cancer per year of operations).

LANL New Facility Alternative

Construction Impacts—No radiological risks would be incurred by members of the public from construction activities. Construction workers would be at a small risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as is reasonably achievable.

Operations Impacts—Under this alternative, the only radiological release associated with operations of the TA-18 capabilities and materials at TA-55 would be 10 curies per year of argon-41 to the atmosphere from Godiva operations (see Section 5.2.3.2). The calculated impacts on the public are presented in **Table 5–10**. The only dose pathway for receptors is from immersion in the passing plume. To put the doses into perspective, comparisons with natural background radiation are included in the table.

Table 5–10 Annual Radiological Impacts on the Public from Relocated TA-18 Operations under the LANL New Facility Alternative

Receptor	*Impact Values*
Population within 80 Kilometers (50 Miles)	
Collective dose (person-rem)	0.011
Percent of natural background radiation [a]	1.1×10^{-5}
Cancer fatalities [b]	5.5×10^{-6}
Maximally Exposed Offsite Individual	
Dose (millirem)	0.0025
Percent of regulatory dose limit [c]	0.025
Percent of natural background radiation [a]	0.00069
Cancer fatality risk [b]	1.3×10^{-9}
Average Individual within 80 Kilometers (50 Miles)	
Dose (millirem)	3.9×10^{-5}
Percent of natural background radiation [a]	1.1×10^{-5}
Cancer fatality risk [b]	2.0×10^{-11}

[a] The average annual dose from background radiation at LANL is 360 millirem (see Section 4.2.11.1); the 283,600 people living within 80 kilometers (50 miles) of the TA-55 site would receive an annual dose of 115,300 person-rem from the background radiation.

[b] Based on a cancer risk estimate of 0.0005 latent cancer fatalities per person-rem (see Appendix B).

[c] This comparison cannot be made for the population and average individual because there is no standard or limit.

As shown in the table, the expected annual dose to the maximally exposed offsite individual member of the public would be much smaller than the limit of 10 millirem per year set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a cancer fatality to this individual from operations would be approximately 1.3×10^{-9} per year (i.e., about 1 chance in 700 million per year of a latent cancer fatality). The projected number of fatal cancers to the population within 80 kilometers (50 miles) would be 5.5×10^{-6} per year (i.e., about 1 chance in 180,000 per year of a latent cancer fatality).

Direct radiation doses to the public from operations of the relocated TA-18 critical assembly machines would be limited based on protective and administrative design features of the new underground facilities. The dose to any member of the public from direct radiation during critical assembly machine operations at the relocated facilities would essentially be zero.

Annual radiological doses to workers involved with TA-55 facility operations under this alternative would be similar to the impacts shown for the TA-18 security Category I/II activities under the No Action

Alternative, as described earlier in this section. As stated, the annual doses to individual workers would be well below the DOE limit of 5,000 millirem (10 CFR 835); the DOE Control Level of 1,000 millirem per year as established in 10 CFR 835.1002; and the DOE recommended Administrative Control Level of 500 millirem (DOE 1999c). The projected number of fatal cancers in the workforce from annual operations would be 0.0040 (or 1 chance in 250 that the workers would experience a fatal cancer per year of operations).

5.2.10.2 Facility Accidents

This section presents the potential impacts on workers (both involved and noninvolved) and the public due to accidents for the No Action, TA-18 Upgrade, and LANL New Facility Alternatives. Additional details supporting the information presented here are provided in Appendix C.

No Action Alternative

Under the No Action Alternative at LANL, TA-18 facilities and operations would remain unchanged. Potential hazards and accidents for TA-18 facilities and operations, applicable to the No Action Alternative, have been studied in detail and are described in a LANL report detailing the *Basis for Interim Operations for the Los Alamos Critical Experiments Facility and Hillside Vault (TA-18 BIO)* (DOE 2001a).

Radiological Impacts—**Table 5–11** shows the frequencies and consequences of the postulated set of accidents for a noninvolved worker and the public (maximally exposed offsite individual and the general population living within 80 kilometers [50 miles] of the facility). **Table 5–12** shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *TA-18 BIO* (DOE 2001a). The selection process and screening criteria used (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur at TA-18 facilities. Thus, in the event that any other accident that was not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

The accident with the highest risk to the offsite population (see Table 5–12) is the hydrogen detonation accident in SHEBA. The increased number of latent cancer fatalities in the offsite population would be 5.1×10^{-5} per year (i.e., about 1 chance in 19,000 per year of a latent cancer fatality). The highest risk of a latent cancer fatality to the maximally exposed offsite individual would be a 1.7×10^{-7} per year (i.e., about one chance in 5 million per year of a latent cancer fatality). The highest risk of a latent cancer fatality to a noninvolved worker located at a distance of 400 meters (437 yards) from the accident would be 2.0×10^{-6} per year (i.e., about 1 chance in 500,000 per year of a latent cancer fatality).

Hazardous Chemicals and Explosives Impacts—There would be no hazardous chemicals or explosives used or stored at TA-18, other than minor industrial quantities, that would impact workers or the public under accident conditions.

Involved Worker Impacts

Approximately 212 workers (including security guards) would be at TA-18 during operations. Most of the workers would be located near the main operations area (Building 30). During criticality experiments, workers would be safely located beyond a prescribed distance from the experiments.

Table 5–11 Accident Frequency and Consequences under the No Action Alternative

		Maximally Exposed Offsite Individual		*Offsite Population* [a]		*Noninvolved Worker*	
	Frequency (per year)	*Dose (rem)*	*Latent Cancer Fatalities* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatalities* [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core accident							
	1.0×10^{-6}	8.70	0.0044	2,580	1.30	133	0.11
Bare, fully reflected or moderated metal criticality accident							
	1.0×10^{-4}	2.5×10^{-7}	1.3×10^{-10}	6.7×10^{-5}	3.3×10^{-8}	2.6×10^{-6}	1.0×10^{-9}
Uncontrolled reactivity insertion in SHEBA in burst mode accident							
	1.0×10^{-6}	22.2	0.022	6,580	3.9	340	0.27
High-pressure spray fire on a Comet machine with a plutonium core accident							
	1.0×10^{-6}	2.1	0.0011	2,180	1.1	6.28	0.0025
Hydrogen detonation in SHEBA accident							
	5.4×10^{-3}	0.063	3.1×10^{-5}	18.8	0.0094	0.91	0.00036
Earthquake-induced facility failures without fire accident							
	1.0×10^{-4}	0.41	0.00021	158	0.079	6.0	0.0024
Inadvertent solution criticality in SHEBA accident							
	1.0×10^{-6}	0.00019	9.3×10^{-8}	0.058	2.9×10^{-5}	0.0018	7.2×10^{-7}

[a] Based on a population of 320,182 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table 5–12 Annual Cancer Risks Due to Accidents under the No Action Alternative

Accident	*Maximally Exposed Offsite Individual* [a]	*Offsite Population* [b, c]	*Noninvolved Worker* [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	4.35×10^{-9}	1.3×10^{-6}	1.1×10^{-7}
Bare, fully reflected or moderated metal criticality	1.3×10^{-14}	3.3×10^{-12}	1.0×10^{-13}
Uncontrolled reactivity insertion in SHEBA in burst mode	2.2×10^{-8}	3.9×10^{-6}	2.7×10^{-7}
High-pressure spray fire on a Comet machine with a plutonium core	1.1×10^{-9}	1.1×10^{-6}	2.5×10^{-9}
Hydrogen detonation in SHEBA	1.7×10^{-7}	5.1×10^{-5}	2.0×10^{-6}
Earthquake-induced facility failures without fire	2.1×10^{-8}	7.9×10^{-6}	2.4×10^{-7}
Inadvertent solution criticality in SHEBA	9.3×10^{-14}	2.9×10^{-11}	7.2×10^{-13}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 320,182 persons residing within 80 kilometers (50 miles) of the site.

Workers in the vicinity of an accident could be at risk of serious injury or fatality. The impacts from the uncontrolled reactivity insertion on Comet or Planet assemblies with a plutonium core provides an indication of typical worker impacts during accident conditions.

Facility operating procedures prohibit personnel from being in the test facility during remote operation of the Comet or Planet assemblies. If an accident were to occur during a test run due to improper experiment setup and/or a combination of operator errors from the control room, the involved workers would be in the remote-control room and no workers would be present in the test facility. Workers in the remote-control room would be protected from direct radiation by a combination of shielding and distance from the immediate impacts of the accident. However, because of lack of building heating, ventilating, and air conditioning high-efficiency particulate air filtration at TA-18, the control-room operators would be exposed

to the radiological plume that would be released after the accident. The protective actions taken by the control-room staff would limit contamination of the control-room environment and protect the involved workers.

In the event that workers setting up a test in the experiment bay inside the Critical Assembly Storage Area (CASA) initiate a criticality accident, it is anticipated that those workers would be subject to serious injury or fatality as a result of the accident.

Following initiation of accident/site emergency alarms, workers in adjacent areas of the facility would evacuate the area in accordance with technical area and test facility emergency operating procedures and training in place.

TA-18 Upgrade Alternative

Under the TA-18 Upgrade Alternative at LANL, TA-18 buildings and operations would be upgraded and include installation of high-efficiency particulate air filters. Potential hazards and accidents for TA-18 buildings and operations, applicable to the TA-18 Upgrade Alternative, have been studied in detail and are described in the *TA-18 BIO* (DOE 2001a).

Radiological Impacts—**Table 5–13** shows the frequencies and consequences of the postulated set of accidents for a noninvolved worker and the public (maximally exposed offsite individual and the general population living within 80 kilometers [50 miles] of the facility). **Table 5–14** shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *TA-18 BIO* (DOE 2001a). The selection process and screening criteria used (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur at TA-18 facilities. Thus, in the event that any other accident not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

The accident with the highest risk to the offsite population (see Table 5–14) is the hydrogen detonation accident in SHEBA. The increased number of latent cancer fatalities in the offsite population would be 5.1×10^{-5} per year (i.e., about 1 chance in 19,000 per year of a latent cancer fatality). The highest risk of a latent cancer fatality to the maximally exposed offsite individual would be a 1.7×10^{-7} per year (i.e., about 1 chance in 5 million per year of a latent cancer fatality). The highest risk of a latent cancer fatality to a noninvolved worker located at a prescribed distance of 400 meters (437 yards) from the accident would be 2.0×10^{-6} per year (i.e., about 1 chance in 500,000 per year of a latent cancer fatality).

Hazardous Chemicals and Explosives Impacts—There would be no hazardous chemicals or explosives used or stored at TA-18, other than minor industrial quantities, that would impact workers or the public under accident conditions.

Table 5–13 Accident Frequency and Consequences under the TA-18 Upgrade Alternative

		Maximally Exposed Offsite Individual		*Offsite Population* [a]		*Noninvolved Worker*	
	Frequency (per year)	*Dose (rem)*	*Latent Cancer Fatalities* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatalities* [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core accident							
	1.0×10^{-6}	0.0087	4.4×10^{-6}	2.58	0.0013	0.13	5.3×10^{-5}
Bare, fully reflected or moderated metal criticality accident							
	1.0×10^{-4}	2.5×10^{-10}	1.3×10^{-13}	6.7×10^{-8}	3.3×10^{-11}	2.6×10^{-9}	1.0×10^{-12}
Uncontrolled reactivity insertion in SHEBA in burst mode accident							
	1.0×10^{-6}	22.2	0.022	6,580	3.9	339	0.27
High-pressure spray fire on a Comet machine with a plutonium core accident							
	1.0×10^{-6}	0.21	0.00011	218	0.11	0.63	0.00025
Hydrogen detonation in SHEBA accident							
	5.4×10^{-3}	0.063	3.1×10^{-5}	18.8	0.0094	0.91	0.00036
Earthquake-induced facility failures without fire accident							
	1.0×10^{-4}	0.41	0.00021	158	0.079	6.0	0.00024
Inadvertent solution criticality in SHEBA accident							
	1.0×10^{-6}	0.00019	9.3×10^{-8}	0.058	2.9×10^{-5}	0.0018	7.2×10^{-7}

[a] Based on a population of 320,182 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table 5–14 Annual Cancer Risks Due to Accidents under the TA-18 Upgrade Alternative

Accident	*Maximally Exposed Offsite Individual* [a]	*Offsite Population* [b, c]	*Noninvolved Worker* [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	4.4×10^{-12}	1.3×10^{-9}	5.3×10^{-11}
Bare, fully reflected or moderated metal criticality	1.3×10^{-17}	3.3×10^{-15}	1.0×10^{-16}
Uncontrolled reactivity insertion in SHEBA in burst mode	2.2×10^{-8}	3.9×10^{-6}	2.7×10^{-7}
High-pressure spray fire on a Comet machine with a plutonium core	1.1×10^{-10}	1.1×10^{-7}	2.5×10^{-10}
Hydrogen detonation in SHEBA	1.7×10^{-7}	5.1×10^{-5}	2.0×10^{-6}
Earthquake-induced facility failures without fire	2.1×10^{-8}	7.9×10^{-6}	2.4×10^{-7}
Inadvertent solution criticality in SHEBA	9.3×10^{-14}	2.9×10^{-11}	7.2×10^{-13}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 320,182 persons residing within 80 kilometers (50 miles) of the site.

Involved Worker Impacts

Approximately 212 workers (including security guards) would be at TA-18 during operations. Most of the workers would be located near the main operations area (Building 30). During criticality experiments, workers would be safely located beyond a prescribed distance from the experiments.

Workers in the vicinity of an accident could be at risk of serious injury or fatality. The impacts from the uncontrolled reactivity insertion on the Comet or Planet assemblies with a plutonium core provides an indication of typical worker impacts during accident conditions.

Facility operating procedures prohibit personnel from being in the test facility during remote operation of the Comet or Planet assemblies. If an accident were to occur during a test run due to improper experiment setup and/or a combination of operator errors from the control room, the involved workers would be in the remote-control room and no workers would be present in the test facility. Workers in the remote-control room would be protected from direct radiation by a combination of shielding and distance from the immediate impacts of the accident. The protective actions taken by the control-room staff would limit contamination of the control-room environment and protect the involved workers.

In the event that workers setting up a test in the experiment bay inside the CASA initiate a criticality accident, it is anticipated that workers in the nearby area would be subject to serious injury or fatality as a result of the accident.

LANL New Facility Alternative

Under the LANL New Facility Alternative, the TA-18 capabilities and materials would be relocated to new buildings to be constructed at LANL TA-55. The new buildings would include safety features that would reduce the risks of accidents that currently exist under the No Action Alternative. From an accident perspective, the proposed new criticality experiments facility would be a robust structure that meets the performance category 3, seismic requirements, and has a full confinement system that includes a tiered pressure zone ventilation and high-efficiency particulate air filters. The accident scenarios described for the No Action Alternative are considered applicable to the LANL New Facility Alternative, with one exception. Accidents associated with SHEBA are excluded because the SHEBA missions would not be moved to LANL's TA-55. The impacts of its proposed relocation to LANL TA-39 are detailed in Section 5.6.3.10. Certain scenario parameter values applicable to the No Action Alternative, such as leak path factors, materials at risk, and the corresponding source term, were adjusted in the impacts analysis to reflect improved safety features of the new structures.

Radiological Impacts—**Table 5–15** shows the frequencies and consequences of the postulated set of accidents for noninvolved worker and the public (maximally exposed offsite individual and the general population living within 80 kilometers [50 miles] of the facility). **Table 5–16** shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *TA-18 BIO* (DOE 2001a). The selection process and screening criteria used (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur at TA-18 facilities. Consideration has also been given to the possibility of an accident at a TA-55 collocated facility that could initiate an accident at the new LANL facility. Because of the underground location of the new LANL facility and distance to any nearby facilities, it was determined that there were no reasonably foreseeable collocated accidents that could affect the new LANL facility. Thus, in the event that any other accident not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

The accident with the highest risk to the offsite population (see Table 5–16) is a high-pressure spray fire on a Comet machine with a plutonium core accident. The increased number of latent cancer fatalities in the offsite population would be 9.1×10^{-8} per year (i.e., about 1 chance in 10 million per year of a latent cancer fatality). The highest risk of a latent cancer fatality to the maximally exposed offsite individual would be 6.1×10^{-11} per year (i.e., about 1 chance in 15 billion per year of a latent cancer fatality). The highest risk of a latent cancer fatality to a noninvolved worker located at a distance of 100 meters (109 yards) from the accident would be 1.6×10^{-9} per year (i.e., about 1 chance in 600 million per year of a latent cancer fatality).

Hazardous Chemicals and Explosives Impacts—There would be no hazardous chemicals or explosives used or stored at the new TA-55 facilities, other than minor industrial quantities, that would impact workers or the public under accident conditions.

Table 5–15 Accident Frequency and Consequences under the LANL New Facility Alternative

		Maximally Exposed Offsite Individual		*Offsite Population* [a]		*Noninvolved Worker*	
	Frequency (per year)	*Dose (rem)*	*Latent Cancer Fatalities* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatalities* [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core accident							
	1.0×10^{-6}	0.0034	1.7×10^{-6}	2.89	0.0014	1.53	0.00061
Bare, fully reflected or moderated metal criticality accident							
	1.0×10^{-4}	1.2×10^{-10}	6.0×10^{-14}	8.5×10^{-8}	4.2×10^{-11}	2.6×10^{-8}	1.0×10^{-11}
High-pressure spray fire on Comet machine with a plutonium core							
	1.0×10^{-6}	0.12	6.1×10^{-5}	181	0.091	4.06	0.0016
Earthquake-induced facility failures without fire							
	1.0×10^{-4}	0.00016	7.8×10^{-8}	0.16	8.0×10^{-5}	0.064	2.6×10^{-5}

[a] Based on a population of 283,571 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table 5–16 Annual Cancer Risks Due to Accidents under the LANL New Facility Alternative

Accident	*Maximally Exposed Offsite Individual* [a]	*Offsite Population* [b, c]	*Noninvolved Worker* [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	1.7×10^{-12}	1.4×10^{-9}	6.1×10^{-10}
Bare, fully reflected or moderated metal criticality	6.0×10^{-18}	4.2×10^{-15}	1.03×10^{-15}
High-pressure spray fire on a Comet machine with a plutonium core	6.1×10^{-11}	9.1×10^{-8}	1.6×10^{-9}
Earthquake-induced facility failures without fire	7.8×10^{-12}	8.0×10^{-9}	2.6×10^{-9}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 283,571 persons residing within 80 kilometers (50 miles) of the site.

Involved Worker Impacts

Approximately 100 workers would be located at the LANL new TA-55 facility. During criticality experiments, workers would be safely located beyond a prescribed distance from the experiments.

Workers in the vicinity of an accident could be at risk of serious injury or fatality. The impacts from the uncontrolled reactivity insertion on the Comet or Planet assemblies with a plutonium core provides an indication of typical worker impacts during accident conditions.

Facility operating procedures prohibit personnel from being in the test facility during remote operation of the Comet or Planet assemblies. If an accident were to occur during a test run due to improper experiment setup and/or a combination of operator errors from the control room, the involved workers would be in the remote-control room and no workers would be present in the test facility. Workers in the remote-control room would be protected by a combination of heating, ventilating, and air conditioning/high-efficiency particulate air filtration; shielding; and distance from the immediate impacts of the accident. The remote-control room engineered safety features and/or protective actions taken by the control-room staff to limit contamination of the control-room environment would also protect the involved workers.

In the event that workers setting up a test in the bay area initiate an accident, it is anticipated these workers would be subject to serious injury or fatality as a result of the accident. Since the facility operating procedures would not prohibit workers from being in adjacent areas during operations, it is anticipated that workers in the vicinity outside of the bay would receive an estimated dose of less than 200 millirem after an uncontrolled criticality event. (This is estimated based on the potential energy released during this accident in relation to that used to design the shielding requirements.)

The facility ventilation system would control dispersal of the airborne radiological debris from the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological risk of injury.

5.2.11 Environmental Justice

No Action Alternative

No disproportionately high and adverse environmental impacts on minority and low-income populations would occur under the No Action Alternative. This conclusion is a result of investigations in this EIS that determined there were no significant impacts on human health, ecological, cultural, paleontological, socioeconomic, and other resource areas described in other subsections of Section 5.2

During normal operations at TA-18, up to 110 curies of the noble gas argon-41 could be activated in the atmosphere. The impacts measured in terms of latent cancer fatalities on the general population would be small, as indicated in Table 5–8. Subsistence consumption of crops and wildlife radiologically contaminated with argon-41 would not be harmful since argon-41 has a half-life of 1 hour and 48 minutes and decays into a stable isotope of potassium that is not harmful to human health in small quantities.

Columns 2 and 3 of Table 5–12 show the radiological risks to the maximally exposed offsite individual and offsite population, respectively, that could result from postulated accidents under the No Action Alternative. All of these risks are at least four orders of magnitude less than one latent cancer fatality. Hence, none of the postulated accidents would pose a significant radiological risk to the public, including minority and low-income individuals and groups within the population at risk.

TA-18 Upgrade Alternative

Construction Impacts—There would be no disproportionately high and adverse environmental impacts on minority and low-income populations due to construction under the TA-18 Upgrade Alternative. As stated in other subsections of Section 5.2, environmental impacts from construction would be small and would not be expected to extend beyond the LANL site boundary.

Operational Impacts—Environmental impacts on minority and low-income populations due to operations and accidents under the TA-18 Upgrade Alternative would be the same as described for the No Action Alternative.

LANL New Facility Alternative

Construction Impacts—There would be no disproportionately high and adverse environmental impacts on minority and low-income populations due to construction under the LANL New Facility Alternative. As stated in other subsections of Section 5.2, environmental impacts from construction would be small and would not be expected to extend beyond the LANL site boundary.

Operations Impacts—No disproportionately high and adverse environmental impacts on minority and low-income populations would occur under the LANL New Facility Alternative. This conclusion is a result of analyses presented in this EIS that determined there were no significant impacts on human health, ecological, cultural, paleontological, socioeconomic, and other resource areas described in other subsections of Section 5.2

During normal operations, approximately 10 curies of the noble gas argon-41 could be activated in the atmosphere. The impacts measured in terms of latent cancer fatalities on the general population would be small, as indicated in Table 5–10. Additionally, subsistence consumption of crops and wildlife radiologically contaminated with argon-41 would not be harmful since argon-41 has a half-life of 1 hour and 48 minutes and decays into a stable isotope of potassium that is not harmful to human health in small quantities.

Columns 2 and 3 of Table 5–16 show the radiological risks to the maximally exposed offsite individual and offsite population, respectively, that could result from postulated accidents under the LANL New Facility Alternative. All of these risks are at least seven orders of magnitude less than one latent cancer fatality. Hence, none of the postulated accidents would pose a significant radiological risk to the public, including minority and low-income individuals and groups within the population at risk.

5.2.12 Waste Management

In accordance with the Records of Decision for the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (*Waste Management PEIS*) (DOE 1997a), waste could be treated and disposed of on site at LANL or at other DOE sites or commercial facilities. Based on the Record of Decision for hazardous waste published on August 5, 1998 (63 FR 41810), nonwastewater hazardous waste will continue to be treated and disposed of at offsite commercial facilities. Based on the Record of Decision for low-level radioactive waste and mixed low-level radioactive waste published on February 18, 2000 (65 FR 10061), minimal treatment of low-level radioactive waste will be performed at all sites, and, to the extent practicable, onsite disposal of low-level radioactive waste will continue. Hanford and NTS will be made available to all DOE sites for disposal of low-level radioactive waste. Mixed low-level radioactive waste analyzed in the *Waste Management PEIS* will be treated at Hanford, the Idaho National Engineering and Environmental Laboratory (INEEL), the Oak Ridge Reservation, and the Savannah River Site and will be disposed of at Hanford and NTS.

It is assumed in this EIS that low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous waste would be treated, stored, and disposed of in accordance with current and developing site practices. No high-level radioactive waste or transuranic waste is generated from the activities conducted at TA-18.

No Action Alternative

The expected waste generation rates at LANL associated with maintaining the current missions at TA-18 for the 25-year operating period are compared with LANL's treatment, storage, and disposal capacities in **Table 5–17**. These waste generation rates are consistent with the Expanded Operations Alternative as described in the *LANL SWEIS* (DOE 1999b) and associated Record of Decision (64 FR 50797, September 20, 1999). The impacts on the LANL waste management systems, in terms of managing the waste, are discussed in this section. Radiological and chemical impacts on workers and the public from waste management activities are included in the public and occupational health and safety impacts provided in Section 5.2.10.

Table 5–17 Waste Management Impacts under the No Action Alternative

Waste Type [a]	*Estimated Waste Generation for TA-18 Mission Operations (cubic meters per year)*	*Estimated Waste Generation as a Percent of* [b]		
		Onsite Treatment Capacity	*Onsite Storage Capacity*	*Onsite Disposal Capacity*
Low-Level Radioactive Waste				
Liquids	0	0	0	0
Solids	145	Not applicable	Not applicable	1.4
Mixed Low-Level Radioactive Waste				
Liquids	0	0	0	0
Solids	1.5	Not applicable	6.4	Not applicable
Hazardous Waste				
Liquids	0	0	0	0
Solids	4 (4,000 kilograms per year)	Not applicable	Not applicable	Not applicable
Nonhazardous Waste				
Sanitary wastewater	14,600 (40,000 liters per day) [c]	1.8	Not applicable	Not applicable
Solids	0	0	0	0

[a] See definitions in Chapter 8.
[b] The estimated amounts of waste generated annually are compared with the annual site treatment capacities. The estimated total amounts of waste generated over the assumed 25-year operating period are compared with the site storage and disposal capacities.
[c] Based on the assumption of 212 workers generating 50 gallons per day.
Not applicable (i.e., the majority of this waste is not routinely treated, stored, or disposed of on site, or is not held in long-term storage).

Solid low-level radioactive waste generated from activities conducted at TA-18 would continue to be characterized and packaged for disposal at the onsite low-level radioactive waste disposal facility at TA-54, Area G. About 3,600 cubic meters (4,700 cubic yards) of solid low-level radioactive waste would be generated over the 25-year operating period of maintaining activities at TA-18. This solid low-level radioactive waste represents about 1.4 percent of the current disposal capacity of the TA-54 Area G Low-Level Radioactive Waste Disposal Facility. As previously discussed in Section 4.2.12.2 of this EIS, as part of the implementation of the Expanded Operations Alternative (Preferred Alternative in the *LANL SWEIS*), the disposal capacity of the TA-54 Area G Low-Level Radioactive Waste Disposal Facility will be expanded into Zones 4 and 6 at Area G. The impacts of managing this waste at LANL would be minimal.

Mixed low-level radioactive waste generated from activities conducted at TA-18 would continue to be surveyed and decontaminated on site, if possible. The remaining waste would be stored on site and transported to a commercial or DOE offsite treatment and disposal facility. This waste would be managed in accordance with the LANL site treatment plan. About 38 cubic meters (50 cubic yards) of mixed low-level radioactive waste would be generated over the 25-year operating period of maintaining activities at TA-18. This mixed low-level radioactive waste represents about 6.4 percent of the current mixed low-level radioactive waste storage capacity at LANL. The impacts of managing this waste at LANL would be minimal.

Hazardous waste generated from activities conducted at TA-18 would continue to be decontaminated or recycled, if possible. The remaining waste would be packaged and shipped to offsite Resource Conservation and Recovery Act (RCRA)-permitted treatment and disposal facilities. Typically, hazardous waste is not held in long-term storage at LANL. The annual estimate of 4,000 kilograms (8,800 pounds) represents about 0.46 percent of the annual hazardous waste generation rate—860,000 kilograms (1,900,000 pounds) per year—for the entire LANL site. The impacts of managing this waste at LANL would be minimal.

Sanitary wastewater generated as a result of maintaining activities at TA-18 would continue to be sent to the Sanitary Wastewater Systems Consolidation Plant at TA-46. About 14,600 cubic meters (19,000 cubic yards) per year of sanitary wastewater would be generated from maintaining activities at TA-18. This sanitary wastewater would represent about 1.8 percent of the 2.27 million-liter-per-day design capacity of the Sanitary Wastewater Systems Consolidation Plant.

TA-18 Upgrade Alternative

Construction Impacts—As previously discussed in Section 4.2.12.1 of this EIS, potential release sites at TA-18 have been investigated and characterized. Most of the potential release sites have been recommended for no further action, following site characterization. Several potential release sites have undergone either interim or final remediation to remove contaminants and decrease the potential for future releases and migration off site. If it is determined that any potential release sites requiring remediation extend into the construction area, further actions, including appropriate documentation, would be completed under the environmental restoration program and in accordance with LANL's Hazardous Waste Facility Permit. Therefore, potential waste generated from such remediation activities is not included in the *TA-18 Relocation EIS* analyses.

Only hazardous and nonhazardous waste types are expected to be generated from the construction activities to modify TA-18 as described under the TA-18 Upgrade Alternative. No radioactive waste is expected to be generated. The impacts on the LANL waste management systems, in terms of managing the waste, are discussed in this section. Radiological and chemical impacts on workers and the public from waste management activities are included in the public and occupational health and safety impacts provided in Section 5.2.10.

Hazardous waste generated from construction activities to modify TA-18 would be decontaminated or recycled, if possible. The remaining waste would be packaged and shipped to off site RCRA-permitted treatment and disposal facilities. Typically, hazardous waste is not held in long-term storage at LANL. About 4,300 kilograms (9,500 pounds) of hazardous waste would be generated (LANL 2001a). This waste represents about 0.5 percent of the annual hazardous waste generation rate for the entire LANL site—860,600 kilograms (1,900,000 pounds) per year. The impacts of managing this waste at LANL would be minimal.

Solid nonhazardous waste generated from construction activities to modify TA-18 would be disposed of at the Los Alamos County Landfill located at LANL or its replacement facility offsite. Approximately 790 cubic meters (1,030 cubic yards) of solid nonhazardous waste, primarily steel, concrete, and other waste, would be generated from the construction activities (LANL 2001a). This waste represents about 14 percent of the current annual solid nonhazardous waste generation rates at LANL—5,453 cubic meters (7,100 cubic yards) per year. The impacts of managing this waste at LANL would be minimal.

Sanitary wastewater generated as a result of construction activities to modify TA-18 would be managed using portable toilet systems.

Operations Impacts—The impacts of managing waste associated with the operations of TA-18 under the TA-18 Upgrade Alternative would be the same as for the No Action Alternative. This is because waste generation during operations would not be affected by the proposed modifications to the facility, and, therefore, the same types and volumes of waste would be generated.

LANL New Facility Alternative

Construction Impacts—As previously discussed in Section 4.2.12.1 of this EIS, based on a review by LANL's Environmental Restoration Project, the boundary of Potential Release Site 48-001 overlaps a small area in the corner of the proposed relocation site at TA-55. This area of overlap involves possible surface soil contamination from TA-48 stack emissions. Before construction activities would begin in TA-55, LANL's Environmental Restoration Project would perform a radiological survey of the area inside the Potential Release Site 48-001 and the area of overlap into TA-55. The purpose of the survey would be to determine whether the Potential Release Site 48-001 extends into the construction area. Based on these survey results, if it is determined that the potential release site extends into the construction area, further actions, including appropriate documentation, would be completed under the environmental restoration program and in accordance with LANL's Hazardous Waste Facility Permit. Therefore, potential waste generated from such remediation activities is not included in the *TA-18 Relocation EIS* analyses.

Only nonhazardous waste is expected to be generated from the construction activities to relocate the TA-18 capabilities and materials to new buildings at TA-55 within LANL. No radioactive or hazardous waste is expected to be generated. The impacts on the LANL waste management systems, in terms of managing the waste, are discussed in this section. Radiological and chemical impacts on workers and the public from waste management activities are included in the public and occupational health and safety impacts provided in Section 5.2.10.

Solid nonhazardous waste generated from construction activities associated with the new building would be disposed of at the Los Alamos County Landfill located at LANL or its replacement facility off site. Approximately 83 cubic meters (108 cubic yards) of solid nonhazardous waste, consisting primarily of gypsum board, wood scraps, scrap metals, and concrete, would be generated from the construction activities (LANL 2001a). This waste represents about 1.5 percent of the current annual solid nonhazardous waste generation rates at LANL— 5,453 cubic meters (4,200 cubic yards) per year. The impacts of managing this waste at LANL would be minimal.

Sanitary wastewater generated as a result of construction activities would be managed using portable toilet systems.

Operations Impacts—The impacts of managing waste associated with operations under the LANL New Facility Alternative are assumed to be the same as for the No Action Alternative. This is because waste generation during operations would not be affected by the relocation of these activities to new facilities, and therefore, the same types and volumes of waste would be generated.

5.2.13 Transportation Impacts

Under the TA-18 Upgrade and the LANL New Facility Alternatives, all radioactive and special nuclear material (SNM) shipments would be conducted within the LANL site. Movement distances would vary from building to building to intrasite moves of several kilometers. Movement of materials would be over short distances on DOE-controlled roads. DOE procedures and U.S. Nuclear Regulatory Commission regulations would not require the use of a certified Type B casks within DOE sites. However, DOE procedures require closing the roads and stopping traffic for shipment of material (fissile or SNM) in noncertified packages. Shipment using certified packages, smaller quantities of radioactive materials and SNM, or depleted or natural uranium shielding, could be performed while site roads are open. For the open-road operations, no incident-free public risk analysis was conducted because the public would receive no measurable exposure to radiological materials. For the TA-18 Upgrade Alternative, the dose to site workers would be the result of miscellaneous SNM movement to support facility upgrades. For the LANL New Facility Alternative, the

radiological dose to site workers would include exposure during packaging and loading of SNM and other related materials at TA-18, transport to TA-55, and unloading and unpacking at TA-55. The dose to site workers under the TA-18 Upgrade Alternative would be about 0.25 person-rem, which corresponds to less than 0.0001 latent cancer fatalities. The dose to site workers under the LANL New Facility Alternative would be 2.3 person-rem, which corresponds to 0.0009 latent cancer fatalities. Dose estimates are described in Appendix D, Section D.7.9. Accident analyses are not necessary because potential accidents during the movement would be bounded in frequency and consequence by facility accidents, presented in Section 5.2.10.2. Once a transportation package is closed for low-speed movement to a nearby facility, the likelihood and consequence of any foreseeable accident were considered to be very small and were not quantified. The dose to site workers from transporting SHEBA and related materials to TA-39 is described in Section 5.6.3.13.

5.2.14 Cumulative Impacts

As previously discussed, impacts associated with the Expanded Operations Alternative presented in the *LANL SWEIS* provide the basis for the No Action Alternative impacts presented in this *TA-18 Relocation EIS*. The No Action Alternative, in turn, provides the baseline from which incremental effects of the proposed action at LANL are measured. The projected incremental environmental impacts of implementing the proposed actions at LANL were added to the environmental impacts of other present and reasonably foreseeable future actions at or near LANL to obtain cumulative site impacts under normal operations.

Most of the ongoing and reasonably foreseeable future actions planned for LANL have already been addressed in the *LANL SWEIS* and are included in the No Action Alternative presented in Section 5.2. Reasonably foreseeable future actions addressed in the *LANL SWEIS* include expansion of the TA-54/Area G low-level radioactive waste disposal area and enhancement of plutonium pit manufacturing. Impacts from other reasonably foreseeable future actions at LANL include those presented in the *LANL SWEIS* and the *Atlas Relocation and Operation at the Nevada Test Site* (DOE 2001c), which are described along with other relevant National Environmental Policy Act (NEPA) reviews in Sections 1.4.1.6 and 1.4.1.14, respectively. The proposed action for the relocation of Atlas to NTS involves the disassembly of the Atlas Facility and machine at LANL and transport to NTS. The contribution to cumulative impacts from the disassembly of the Atlas Facility at LANL is expected to be negligible. Impacts from these actions were factored into estimates of total cumulative impacts, where possible, for the potentially affected resource areas presented in this section.

Cumulative transportation impacts were determined by analyzing the impacts along the various routes used to transport the materials associated with relocated TA-18 activities over the 25-year operating period. The methodology for assessing cumulative impacts is presented in Appendix F.

In this section, cumulative site impacts are presented only for those "resources" at a site that reasonably may be expected to be affected by the proposed action. These include electrical consumption, water usage, air quality, waste management, and public and occupational health and safety. This section also includes the cumulative impacts associated with intersite transportation.

Resource Requirement Impacts—As previously discussed in Section 5.2.2, site electrical capacity in terms of electric peak load and the available site water capacity could be exceeded in the future even in the absence of any new demands associated with TA-18 relocation activities. This potential exists based on the projected infrastructure requirements to implement the *LANL SWEIS* Expanded Operations Alternative and the forecasted demands of other non-LANL users. Should these projections be fully realized over the 25-year time frame analyzed in this document, LANL could cumulatively require 121 percent of the current peak load capacity, 97 percent of its total available electrical capacity, and 141 percent of the available water capacity.

Thus, additional peak load and water supply capacity would be needed. As a worst-case alternative, implementation of the LANL New Facility Alternative under this scenario would account for about 2 percent of both the site's use of electric peak load and total electrical capacity, with no expected net increase in water use. No infrastructure capacity constraints are anticipated in the near term, as LANL operational demands to date on key infrastructure resources, including electricity and water, have been well below projected levels and well within site capacities. Any potential shortfalls in available capacity would be addressed as increased site requirements are realized.

Air Quality Impacts—Cumulative impacts on air quality at LANL would be the same as discussed in the *LANL SWEIS*, except that during the annual 24-hour testing of the emergency diesel generator, elevated concentrations of nitrogen dioxide may occur along Pajarito Road. Since the 24-hour nitrogen dioxide standard value can be exceeded once per year, one day of testing would not be expected to result in an exceedance of the standard, even under the conservative modeling assumptions used in evaluating the impact of these generators. As such, LANL would continue to be in compliance with all Federal and state ambient air quality standards. The contribution to cumulative air quality impacts from the disassembly of the Atlas Facility at LANL is expected to be minor.

Public and Occupational Health and Safety – Normal Operations Impacts—Cumulative impacts in terms of radiation exposure to the public and workers at LANL would be within the level of impacts forecast under the Expanded Operations Alternative described in the *LANL SWEIS*. The contribution to cumulative public and occupational health and safety impacts from the disassembly of the Atlas Facility at LANL is expected to be minor. There would be no increase expected in the number of latent cancer fatalities in the population from site operations if TA-18 operations were to occur at LANL. The dose limits for individual members of the public are given in DOE Order 5400.5. As discussed in that order, the dose limit from airborne emissions is 10 millirem per year, as required by the Clean Air Act; the dose limit from drinking water is 4 millirem per year, as required by the Safe Drinking Water Act; and the dose limit from all pathways combined is 100 millirem per year. Therefore, the dose to the maximally exposed offsite individual would be expected to remain well within the regulatory limits. Onsite workers would not be expected to have any increase in the number of latent cancer fatalities due to radiation from TA-18 operations over the 25-year operating period.

Waste Management Impacts—Cumulative amounts of waste generated at LANL from TA-18 operations would remain within the level of impacts forecast under the Expanded Operations Alternative described in the *LANL SWEIS*. In addition, the refurbishment of criticality machines associated with the relocation of TA-18 missions would generate less than 6.4 metric tons (7 tons), or about 1.5 cubic meters (2 cubic yards), of low-level radioactive and mixed low-level radioactive waste. This one-time generation of waste would consist of old electrical racks, hydraulic systems, control cartridges, and machine stands that would be replaced by new components as part of TA-18 mission relocation activities. It is unlikely that this refurbishment would be a major impact on waste management at LANL because sufficient capacity exists to manage the site waste. The contribution to cumulative waste management impacts from the disassembly of the Atlas Facility at LANL is expected to be minor.

Transportation Impacts—The cumulative impacts from transportation associated with the relocation of TA-18 operational capabilities and materials are identified in Appendix D. Because likely transportation routes cross many states, cumulative impacts are compared on a national basis. Under the LANL alternatives assessed in this *TA-18 Relocation EIS*, occupational radiation exposure to transportation workers and exposure to the public are estimated to represent less than 0.01 percent of the cumulative exposures from nationwide transportation (DOE 2002). No additional traffic fatality is expected; the incremental increase in traffic fatalities would be less than 0.0001 percent per year.

5.3 SNL/NM ALTERNATIVE

Section 5.3 discusses the environmental impacts associated with the relocation of the TA-18 operational capabilities and materials to the SNL/NM site. As discussed in Section 3.3.4, the relocation would involve only security Category I/II activities. The environmental impacts associated with the relocation of SHEBA activities and other security Category III/IV activities are discussed separately in Section 5.6.

Under the SNL/NM Alternative, the TA-18 operational capabilities and materials associated with security Category I/II activities would be relocated to a new facility building to be constructed at SNL/NM. The alternative also involves internal modifications and upgrades of existing buildings at SNL/NM to support the security Category I/II activities (see Section 3.3.4). The Expanded Operations Alternative presented in the *Sandia National Laboratories/New Mexico Final Site-Wide Environmental Impact Statement* (*SNL/NM SWEIS*) (DOE 1999d) provides the baseline from which incremental effects of the proposed action at SNL/NM are measured.

5.3.1 Land Resources

5.3.1.1 Land Use

Construction Impacts—Under this alternative, approximately 1.8 hectares (4.5 acres) of land would be disturbed by construction of a new underground facility at TA-V. The building could be constructed southeast or southwest of the Sandia Pulsed Reactor Building. Both locations would require the relocation of the current TA-V Perimeter Intrusion Detection and Assessment System (PIDAS). Realigning the PIDAS would enclose up to 5 additional hectares (12.4 acres) of TA-V within the security fence. In addition, 10 existing aboveground buildings would be modified or renovated to meet TA-18 relocation requirements. Construction of new buildings and modification or renovation of existing buildings would be compatible with current land use within TA-V.

Operations Impacts—Operations of a new underground facility and modified existing buildings would be compatible with current activities at TA-V. Thus, there would be no impact on land use during the operational phase of the proposed action.

5.3.1.2 Visual Resources

Construction Impacts—Activities related to the construction of a new underground facility for TA-18 missions would result in a change to the visual appearance of TA-V due to the presence of construction equipment and possibly increased dust. These changes would be temporary and, due to the isolated location of TA-V, likely would not be noticeable from areas off Kirtland Air Force Base (KAFB). Most changes to the 10 existing buildings also required to support TA-18 operations would be internal with only minor external changes.

Operations Impacts—Once operational, a new underground facility building would be covered with soil and revegetated with grasses, and modifications to the 10 buildings required to support TA-18 operations would result in little change in the appearance of the area. Thus, the current Class IV Bureau of Land Management Visual Resource Management rating of TA-V would not change and there would be no impact on visual resources at the site.

5.3.2 Site Infrastructure

Construction Impacts—The projected demands on key site infrastructure resources associated with site construction under this alternative on an annualized basis are presented in **Table 5–18**. Existing KAFB infrastructure would easily be capable of supporting the construction requirements for the new underground facility and modifications to existing facilities at SNL/NM proposed under this alternative without exceeding site capacities. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, fuel would be procured from offsite sources and, therefore, would not be a limited resource. Impacts on the local transportation network are expected to be negligible.

Table 5–18 Annual Site Infrastructure Requirements for Facility Construction under the SNL/NM Alternative

Resource	*Available Site Capacity* [a]	*SNL/NM Alternative*	
		Requirement	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	596,000.00	128	0.02
Peak load (megawatts)	56	0.13	0.2
Fuel			
Natural gas (cubic meters per year)	29,400,000.00	0	0
Gasoline and diesel fuel (liters per year) [b]	Not limited	Negligible	Negligible
Water (liters per year)	3,200,000,000.00	17,000,000.00	0.5

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 4–19, *TA-18 Relocation EIS*.
[b] Not limited due to offsite procurement.
Sources: Table 4–19, *TA-18 Relocation EIS*; SNL/NM 2001b.

Operations Impacts—Resources needed to support operations under the SNL/NM Alternative are presented in **Table 5–19**. It is projected that existing KAFB and SNL/NM infrastructure resources would be adequate to support proposed mission activities over 25 years. In general, infrastructure requirements under this alternative would approximate those of the LANL New Facility Alternative.

Table 5–19 Annual Site Infrastructure Requirements for Facility Operations under the SNL/NM Alternative

Resource	*Available Site Capacity* [a]	*SNL/NM Alternative*	
		Requirement	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	596,000	21,000	3.5
Peak load (megawatts)	56	3	5.4
Fuel			
Natural gas (cubic meters per year)	29,400,000	Negligible	Negligible
Liquid fuels (liters per year) [b]	Not limited	Negligible	Negligible
Coal (metric tons per year)	Not applicable	0	Not applicable
Water (liters per year)	3,200,000,000	6,900,000	0.2

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 4–19, *TA-18 Relocation EIS*.
[b] Not limited due to offsite procurement.
Sources: Table 4–19, *TA-18 Relocation EIS*; SNL/NM 2001b.

5.3.3 Air Quality

5.3.3.1 Nonradiological Releases

Construction Impacts—Construction of new buildings and modification of existing buildings at TA-V would result in an increase in air quality impacts from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations for construction were modeled and compared to the most stringent standards (see **Table 5–20**). The maximum ground-level concentrations that would result from construction would be well below the ambient air quality standards. The maximum concentrations would occur at the SNL/NM site boundary west-northwest of TA-V. Modeling of construction air quality considered particulate emissions from activity in a construction area of 1.8 hectares (4.5 acres) for security Category I/II activities and emissions from various earthmoving and materials-handling equipment.

Table 5–20 Nonradiological Air Quality Concentrations at the Site Boundary under the SNL/NM Alternative – Construction

	Averaging Period	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 Hours 1 Hour	8,280 12,500	3.77 30.2
Nitrogen dioxide	Annual 24 Hours	78.1 156	0.003 3.43
PM_{10}	Annual 24 Hours	50 150	0.055 4.82
Sulfur dioxide	Annual 24 Hours 3 Hours	43.5 217 1,090	less than 0.001 0.469 3.75
Total suspended particulates	Annual 24 Hours	60 150	0.11 9.31

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The National Ambient Air Quality Standards (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million. These values have been converted to micrograms per cubic meter with appropriate corrections for temperature (21 °C [70 °F]) and pressure (elevation 1,600 meters [5,400 feet]), following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The concentrations were analyzed at locations to which the public has access—the site boundary, nearby sensitive areas, and onsite military housing.

Sources: 40 CFR 50, DOE 1999d, SNL/NM 2001b.

Operations Impacts—Under the SNL/NM Alternative, small quantities of criteria and toxic air pollutants would be generated from the operation of the emergency diesel generators and other activities. The emissions from the generators would be independent of the activities being performed at TA-V, since they result primarily from periodic testing. **Table 5–21** summarizes the concentrations of criteria pollutants from operation of the diesel generators. The concentrations are compared to their corresponding ambient air quality standards. The maximum concentrations that would result from operations would occur along the SNL/NM boundary to the west-northwest to southwest. No major change in emissions or air pollutant concentrations is expected under this alternative. Therefore, a Prevention of Significant Deterioration increment analysis is not required (see Appendix F, Section F.3.1). SNL/NM is located in an attainment area for criteria air pollutants and a maintenance area for carbon monoxide. Since the area is a maintenance area for carbon monoxide and emissions of carbon monoxide are below the applicability level of 91 metric tons (100 tons) per year for maintenance areas, no conformity analysis is required (see Appendix F, Section F.3.2).

Table 5–21 Nonradiological Air Quality Concentrations at the Site Boundary under the SNL/NM Alternative – Operations

	Averaging Period	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 Hours 1 Hour	8,280 12,500	1.23 9.59
Nitrogen dioxide	Annual 24 Hours	78.1 156	less than 0.001 2.22
PM_{10}	Annual 24 Hours	50 150	less than 0.001 0.158
Sulfur dioxide	Annual 24 Hours 3 Hours	43.5 217 1,090	less than 0.001 0.147 1.0
Total suspended particulates	Annual 24 Hours	60 150	less than 0.001 0.158

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The National Air Ambient Air Quality Standards (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million. These values have been converted to micrograms per cubic meter with appropriate corrections for temperature (21 °C [70 °F]) and pressure (elevation 1,600 meters [5,400 feet]), following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The concentrations were analyzed at locations to which the public has access—the site boundary, nearby sensitive areas, and onsite military housing.

Sources: 40 CFR 50, DOE 1999d, SNL/NM 2001b.

5.3.3.2 Radiological Releases

Construction Impacts—While no radiological releases to the environment are expected in association with construction activities at TA-V, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contamination and would be required to remediate any contamination in accordance with procedures established under SNL/NM's environmental restoration program.

Operations Impacts—Approximately 10 curies per year of argon-41 would be released from the relocated TA-18 operational capabilities and materials at SNL/NM (see Section 3.2.1). There would be no other radiological releases from the relocated mission activities. Impacts from radiological releases are described in Section 5.3.10.1.

5.3.4 Noise

Construction Impacts—Construction of new buildings and modification of buildings at SNL/NM's TA-V would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of operation of construction equipment. There would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments along routes leading to SNL/NM. Noise sources associated with construction at TA-V are not expected to include loud impulsive sources such as blasting.

Operations Impacts—Noise impacts from operations of new buildings at TA-V are expected to be similar to these from existing operations at TA-V. Although there would be a small increase in traffic and equipment

noise (e.g., heating and cooling systems, generators, etc.) near the area, there would be little change in noise impacts on wildlife and little increase in noise impacts on the public outside of SNL/NM as a result of moving security Category I/II activities to SNL/NM.

5.3.5 Geology and Soils

Construction Impacts—Construction activities under the SNL/NM Alternative are expected to disturb a total of approximately 1.8 hectares (4.5 acres) of currently vacant land located just southeast or southwest of the Sandia Pulsed Reactor Facility within TA-V. Aside from additional renovations of existing structures, this disturbance would be associated with the construction of a new underground facility building, with the facility size and total land disturbance approximating that associated with the LANL New Facility Alternative. Although aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-V, these resources are abundant throughout the Albuquerque-Belen Basin. Also, as blasting should not be necessary due to the relatively unconsolidated nature of the subsurface strata, and because the land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor overall. A site survey and foundation study would be conducted as necessary to confirm site geologic characteristics for facility engineering purposes. The potential also exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and remediation required in accordance with the procedures established under the site's environmental restoration program.

As discussed in Section 4.3.5, KAFB and SNL/NM are located in a region with relatively moderate to high seismicity. Ground shaking of Modified Mercalli Intensity VII (see Appendix F, Table F–6) associated with postulated earthquakes is possible and supported by the historical record for the region. Modified Mercalli Intensity VII ground shaking would be expected to affect primarily the integrity of inadequately designed or nonreinforced structures, but damage to properly or specially designed or upgraded facilities would not be expected. Although mapped faults cross KAFB just to the east of TA-V, none are currently considered capable. The potential for other large-scale geologic hazards to affect TA-V facilities is also low.

As stated in DOE Order 420.1, DOE is required to ensure that nuclear and nonnuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

Operations Impacts—The operations of the new and modified buildings under this alternative would not be expected to result in impacts on geologic and soil resources at SNL/NM. As discussed above, the proposed new underground facility building and renovated buildings would be evaluated, designed, and constructed in accordance with DOE Order 420.1 and sited to minimize the risk from geologic hazards. Thus, site geologic conditions would not likely affect the facilities.

5.3.6 Water Resources

5.3.6.1 Surface Water

Construction Impacts—Surface water would not be used to support the construction of the new underground facility building or renovations of existing buildings at SNL/NM's TA-V. Groundwater is the source of water at SNL/NM. There are no natural surface water drainages in the vicinity of TA-V, although a drainage ditch conveys storm-water runoff to Arroyo del Coyote located just to the northeast of TA-V. This arroyo is not perennial and is not a viable source of surface water. Therefore, there would be no construction impact on surface water availability. Sanitary wastewater would be generated by construction personnel. As plans

include the use of portable toilets, there would be no onsite discharge of sanitary wastewater and no impact on surface waters. Waste generation and management activities are detailed in Section 5.3.12.

Storm-water runoff from construction areas could potentially impact downstream surface water quality, especially if points of disturbance or construction lay-down areas are located in proximity to storm drains or collector ditches leading to Arroyo del Coyote. However, effects on runoff quality likely would be very localized and of short duration. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) and spill prevention practices would be employed during construction to minimize suspended sediment and material transport and potential water quality impacts. TA-V is not in an area prone to flooding.

Operations Impacts—No impacts on surface water resources are expected as a result of operations at TA-V under this alternative. No surface water would be used to support facility activities and there would be no direct discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from facility staff use of lavatory, shower, and break-room facilities, and from miscellaneous potable and sanitary uses. Nevertheless, it is planned that this wastewater would be collected and conveyed to existing wastewater treatment facilities. In addition, no industrial or other NPDES-regulated discharges to surface waters are anticipated. Waste generation and management activities are detailed in Section 5.3.12. Overall, operational impacts on site surface waters and downstream water quality would be expected to be negligible.

5.3.6.2 Groundwater

Construction Impacts—Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and to meet the potable and sanitary needs of construction employees. Water use by construction personnel would be greatly reduced over that normally required by the proposed use of portable toilets. In addition, concrete and the water required for concrete mixing would likely be procured off site. As a result, it is estimated that construction activities would require approximately 17 million liters (4.5 million gallons) of groundwater on an annualized basis (see Table 5–18) to support new facility construction and renovations to existing facilities. It is currently anticipated that this water would be derived from the KAFB groundwater distribution system serving SNL/NM via a temporary service connection or trucked to the point of use, especially during the early stages of construction. The relatively small volume of groundwater required during the period of construction compared to site availability and historic usage indicates that construction withdrawals should not have an additional impact on regional groundwater levels or availability. Excavation associated with construction of the underground SNM facility building would not be expected to affect groundwater quality or flow, as the depth of groundwater is generally greater than 100 meters (330 feet). Thus, construction dewatering is not expected to be required.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls, countermeasures, and procedures would be employed to minimize the chance for petroleum, oils, lubricants, and other materials used during construction to be released to the surface or subsurface and to ensure that waste materials are properly disposed of. Waste generation and management activities are detailed in Section 5.3.12. In general, no impact on groundwater availability or quality is anticipated.

Operations Impacts—Facilities housing the relocated TA-18 operations at TA-V under the SNL/NM Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel as well as for miscellaneous building mechanical uses. It is estimated that about 6.9 million liters (1.8 million gallons) of water would be required annually for facility operations. As this demand would be

a small fraction of existing KAFB usage and would not exceed site availability (see Table 5–19), no additional measurable impact on regional groundwater levels or availability would be anticipated.

No sanitary or industrial effluent would be directly discharged to the surface or subsurface. Waste generation and management activities are detailed in Section 5.3.12. Thus, no operational impacts on groundwater quality would be expected.

5.3.7 Ecological Resources

5.3.7.1 Terrestrial Resources

Construction Impacts—Under this alternative, approximately 1.8 hectares (4.5 acres) of land would be disturbed by construction of the new underground facility building. The building could be constructed southeast or southwest of the Sandia Pulsed Reactor Building. Both locations would require the relocation of the current TA-V PIDAS. Realigning the PIDAS would enclose up to 5 additional hectares (12.4 acres) of TA-V within the security fence. The area on which the facility building would be constructed is covered by grassland; however, grasslands are common on KAFB, and the area lost represents a small percentage of this habitat type present within the immediate area or on KAFB as a whole.

Wildlife using the site proposed for a new underground facility would be lost or displaced by construction. Wildlife so affected would primarily include species common to grasslands, but would also include animals found within the disturbed portions of TA-V, such as the European starling, house sparrow, and small mammals. Once the new underground facility is complete, it would be covered with earth and revegetated with grasses. Thus, a portion of the area would be available to some of the same species displaced by construction. Noise associated with earthmoving activities and construction could cause temporary disturbance to wildlife found in areas adjacent to the construction site; however, such disturbance would be temporary. Since all activities would take place within a defined construction zone, direct human disturbance to wildlife and wildlife habitat outside of that zone, such as might be caused by the movement of equipment, would not occur.

Operations Impacts—Operations of facilities associated with relocated TA-18 operations would not be expected to impact either wildlife or wildlife habitat at SNL/NM because relocated TA-18 operations would not produce emissions or effluent of quality or at levels that would likely affect wildlife.

5.3.7.2 Wetlands

Construction and Operations Impacts—Since there are no wetlands located within or adjacent to TA-V, construction and operations of the new underground facility would not impact this resource. For the same reason, modification or renovation of the 10 existing buildings at TA-V also would not have an impact on wetlands.

5.3.7.3 Aquatic Resources

Construction and Operations Impacts—Since there are no aquatic resources located within or immediately adjacent to TA-V, construction and operations of a new underground facility building would not impact this resource. For the same reason, modification or renovation of the 10 existing buildings at TA-V also would not have an impact on aquatic resources. Normal erosion and sediment control measures would be implemented during both construction and operations, thus preventing uncontrolled runoff from leaving the site and impacting more distant aquatic systems.

5.3.7.4 Threatened and Endangered Species

Construction and Operations Impacts—Under the SNL/NM Alternative, there would be no impacts on threatened and endangered species at TA-V from construction because no threatened or endangered species occur within the region of influence. Operations impacts would not impact threatened and endangered species because relocated TA-18 operations would not produce emissions or effluent of a quality or at levels that would likely affect these species.

5.3.8 Cultural and Paleontological Resources

5.3.8.1 Prehistoric Resources

Construction and Operations Impacts—TA-V has been completely inventoried for prehistoric sites (see Section 4.3.8.1) and none have been found. Thus, it is unlikely that these resources would be impacted by construction and operations of the new underground facility building and modification or renovation of the 10 buildings required to support TA-18 operations. Nevertheless, prior to construction, a cultural resource survey of areas to be disturbed would be conducted and site mitigations would be applied, if needed. If prehistoric resources were discovered during construction, all work potentially affecting the resources would stop. This work stoppage would be followed by investigations by qualified cultural resource specialists; any coordination necessary with the State Historic Preservation Office; and development and implementation of measures to salvage these resources.

5.3.8.2 Historic Resources

Construction and Operations Impacts—As is the case for prehistoric resources, TA-V has been completely inventoried for historic sites (see Section 4.3.8.2), with negative results. Assessments of buildings at TA-V for inclusion in the National Register of Historic Places have not been made, since structures located there are less than 50 years old. Thus, impacts on historic structures at TA-V would not be expected under this alternative.

5.3.8.3 Native American Resources

Construction and Operations Impacts—Traditional cultural properties have not been identified within TA-V (nor on KAFB as a whole), nor have any prehistoric or historic resources related to Native Americans been discovered within the site (see Sections 4.3.8.1 and 4.3.8.2). Thus, impacts on Native American resources resulting from the relocation of TA-18 operations at TA-V would not be expected. However, as noted in Section 5.3.8.1, if any such resources were located during construction, work would stop while appropriate action was taken.

5.3.8.4 Paleontological Resources

Construction and Operations Impacts—Palentological resources would not be affected by construction or operations of relocated TA-18 operational capabilities and materials at TA-V, since such resources have not been found in the area.

5.3.9 Socioeconomics

Construction Impacts—Construction of a new underground facility building and modifications to existing buildings at TA-V would require a peak construction employment level of 300 workers. This level of employment would generate about 1,149 indirect jobs in the region around SNL/NM. The potential total

employment increase of 1,449 direct and indirect jobs represents an approximate 0.4 percent increase in the workforce and would occur only over the 16 months of construction. It would have no noticeable impact on the socioeconomic conditions of the region of influence.

Operations Impacts—Relocation of TA-18 operational capabilities and materials associated with security Category I/II activities to SNL/NM could result in the permanent relocation or hiring of approximately 20 new employees and a small reduction in employment levels at LANL. This level of employment would generate about 77 indirect jobs in the region around SNL/NM. The potential total employment increase of 97 direct and indirect jobs represents an approximate 0.03 percent increase in the workforce. It would have no noticeable impact on the socioeconomic conditions of the region of influence.

5.3.10 Public and Occupational Health and Safety

The assessments of potential radiological impacts associated with the SNL/NM Alternative are presented in this section. No chemical-related health impacts are associated with any of these alternatives because only very small quantities of industrial-type chemicals, such as ethanol, isopropyl alcohol, magnesium oxide, phenylphosphine, and xylene, would be used. As stated in the *LANL SWEIS* (DOE 1999b), the quantities of these chemicals that could be released to the atmosphere during normal operations are minor and would be below the screening levels used to determine the need for additional analysis. There would be no operational increase in the use of these chemicals as a result of the proposed action. No chemicals have been identified that would be a risk to members of the public from construction activities associated with the SNL/NM Alternative. Construction workers would be protected from hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. The potential occupational (industrial) impacts on workers during construction and operations were evaluated based on DOE and Bureau of Labor statistic data and are detailed in Section C.7 of Appendix C. Construction and operations activities under this alternative are expected to result in some injuries but no fatalities to workers for the duration of the proposed action (i.e., about 3 years of construction and 25 years of operations).

Summaries of radiological impacts from normal operations and postulated accidents are presented below. The methodologies used to determine the impacts on the public and facility workers are presented in Appendix B. Supplemental information associated with normal operations and postulated accidents is provided in Appendices B and C, respectively.

5.3.10.1 Construction and Normal Operations

Construction Impacts—No radiological risks would be incurred by members of the public from construction activities. Construction workers may be at a small risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as is reasonably achievable.

Operations Impacts—Under this alternative, the only radiological release would be 10 curies per year of argon-41 to the atmosphere from Godiva operations (see Section 5.3.3.2). The associated calculated impacts on the public are presented in **Table 5–22**. The only dose pathway for receptors is from immersion in the passing plume. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

As shown in the table, the expected annual radiation dose to the maximally exposed offsite individual member of the public would be much smaller than the limit of 10 millirem per year set by both the EPA

(40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a cancer fatality to this individual from annual operations would be approximately 1.6×10^{-10} (i.e., about 1 chance in 6 billion per year of a latent cancer fatality). The projected number of fatal cancers to the population within 80 kilometers (50 miles) would be 1.0×10^{-5} per year (i.e., about 1 chance in 100,000 per year of a latent cancer fatality).

Table 5–22 Annual Radiological Impacts on the Public from TA-18 Operations at SNL/NM

Receptor	*Impact Values*
Population within 80 Kilometers (50 Miles)	
Collective dose (person-rem)	0.020
Percent of natural background radiation [a]	8.1×10^{-6}
Cancer fatalities [b]	1.0×10^{-5}
Maximally Exposed Offsite Individual	
Dose (millirem)	0.00032
Percent of regulatory dose limit [c]	0.0032
Percent of natural background radiation [a]	9.6×10^{-5}
Cancer fatalities risk [b]	1.6×10^{-10}
Average Individual within 80 Kilometers (50 Miles)	
Dose (millirem)	2.7×10^{-5}
Percent of natural background radiation [a]	8.1×10^{-6}
Cancer fatalities risk [b]	1.3×10^{-11}

[a] The average annual dose from background radiation at SNL/NM is 332 millirem (see Section 4.3.11.1); the 745,287 people living within 80 kilometers (50 miles) of the TA-V site would receive an annual dose of 247,000 person-rem from the background radiation.

[b] Based on a cancer risk estimate of 0.0005 latent cancer fatalities per person-rem (see Appendix B).

[c] This comparison cannot be made for the population and average individual because there is no standard or limit.

Direct radiation doses to the public from operations of the relocated TA-18 critical assembly machines would be limited based on protective and administrative design features of the new underground facilities. The dose to any member of the public from direct radiation during critical assembly machine operations at the relocated facilities would essentially be zero.

Annual radiological doses to the 100 workers involved with TA-18 operations at TA-V under this alternative would average 100 millirem per worker, for a total workforce annual dose of 10 person-rem. The annual doses to individual workers would be well below the DOE limit of 5,000 millirem (10 CFR 835); the DOE Control Level of 1,000 millirem per year, as established in 10 CFR 835.1002; and the recommended Administrative Control Level of 500 millirem (DOE 1999c). An individual worker's annual risk of a fatal cancer is projected to be 4.0×10^{-5} (i.e., about 1 chance in 25,000 per year of a latent cancer fatality), and the projected number of fatal cancers in the workforce from operations would be 0.0040 per year (or 1 chance in 250 that the workers would experience a fatal cancer per year of operations).

5.3.10.2 Facility Accidents

Under the SNL/NM Alternative, TA-18 operational capabilities and materials associated with security Category I/II activities would be relocated to a new underground facility building to be constructed and the 10 existing aboveground buildings that would be modified or renovated within TA-V. The new buildings would include safety features that would reduce the risks of accidents that currently exist at LANL under the No Action Alternative. From an accident perspective the proposed new facility building would be an underground structure that meets performance category 3 seismic requirements and has a full confinement system that includes a tiered pressure zone ventilation and high-efficiency particulate air filters. The accident scenarios described for the No Action Alternative at LANL are considered applicable to the SNL/NM new

facility, with one exception. Accidents associated with SHEBA are excluded because the SHEBA missions would be moved to LANL's TA-39; its impacts are shown in Section 5.6.3.10. Certain scenario parameter values applicable to the No Action Alternative, such as leak path factors, materials at risk, and the corresponding source term, have been adjusted to reflect improved safety features of the new facility.

Radiological Impacts—**Table 5–23** shows the frequencies and consequences of the postulated set of accidents for a noninvolved worker and the public (the maximally exposed offsite individual and the general population living within 80 kilometers [50 miles] of the facility). **Table 5–24** shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident could occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *TA-18 BIO* (DOE 2001a). The selection process and screening criteria used (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur at TA-18 facilities. Thus, in the event that any other accident not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5–23 Accident Frequency and Consequences under the SNL/NM Alternative

		Maximally Exposed Offsite Individual		*Offsite Population* [a]		*Noninvolved Worker*	
	Frequency (per year)	*Dose (rem)*	*Latent Cancer Fatalities* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatalities* [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core accident							
	1.0×10^{-6}	0.00087	4.4×10^{-7}	5.3	0.0026	0.572	0.00023
Bare, fully reflected or moderated metal criticality accident							
	1.0×10^{-4}	3.2×10^{-11}	1.6×10^{-14}	1.5×10^{-7}	7.4×10^{-11}	9.9×10^{-9}	4.0×10^{-12}
High-pressure spray fire on a Comet machine with a plutonium core							
	1.0×10^{-6}	0.033	1.7×10^{-5}	433	0.216	6.91	0.0028
Earthquake-induced facility failures without fire accident							
	1.0×10^{-4}	3.7×10^{-5}	1.8×10^{-8}	0.291	0.00015	0.026	1.0×10^{-5}

[a] Based on a population of 745,287 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table 5–24 Annual Cancer Risks Due to Accidents under the SNL/NM Alternative

Accident	*Maximally Exposed Offsite Individual* [a]	*Offsite Population* [b, c]	*Noninvolved Worker* [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	4.4×10^{-13}	2.6×10^{-9}	2.3×10^{-10}
Bare, fully reflected or moderated metal criticality	1.6×10^{-18}	7.4×10^{-15}	4.0×10^{-16}
High-pressure spray fire on a Comet machine with a plutonium core	1.7×10^{-11}	2.2×10^{-7}	2.8×10^{-9}
Earthquake-induced facility failures without fire	1.8×10^{-12}	1.5×10^{-8}	1.0×10^{-9}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 745,287 persons residing within 80 kilometers (50 miles) of the site.

Consideration has also been given to the possibility of an accident at a collocated TA-V facility that could initiate an accident at the new SNL/NM facility. Because of the underground location of the new SNL/NM building and the distance to any nearby buildings, it was determined that there were no reasonably foreseeable collocated accidents. The new SNL/NM buildings would be located in the vicinity of the Albuquerque International Sunport aircraft runways. Small and large commercial aircraft and military

aircraft use the runways. The annual probability of an aircraft crashing into a building located at TA-V has been estimated at 6.3×10^{-6} (DOE 1999d). Because the new facility building would be located underground, any aircraft crash into the building would not result in the release of nuclear materials (SNL/NM 2001b). Aboveground buildings would have either administrative functions or contain small amounts of radioactive materials, in which case the impacts of an aircraft crash would be bounded by the accidents analyzed in Tables 5–23 and 5–24.

The accident with the highest risk to the offsite population (see Table 5–24) would be a high-pressure spray fire on a Comet machine with a plutonium core accident. The increased number of latent cancer fatalities in the offsite population would be 2.2×10^{-7} per year (i.e., about 1 chance in 4 million per year of a latent cancer fatality). The highest risk of a latent cancer fatality to the maximally exposed offsite individual would be 1.7×10^{-11} per year (i.e., about 1 chance in 60 billion per year of a latent cancer fatality). The highest risk of a latent cancer fatality to a noninvolved worker located at a prescribed standoff distance of 100 meters (109 yards) from the accident would be 2.8×10^{-9} per year (i.e., about 1 chance in 300 million per year of a latent cancer fatality).

Hazardous Chemicals and Explosives Impacts—There would be no hazardous chemicals or explosives used or stored at the new or modified SNL/NM facilities, other than minor industrial quantities, that would impact workers or the public under accident conditions.

Involved Worker Impacts

Approximately 100 workers would be located at the new SNL/NM facility. During criticality experiments, workers would be safely located beyond a prescribed distance from the experiments.

Workers in the vicinity of an accident could be at risk of serious injury or fatality. The impacts from the uncontrolled reactivity insertion on the Comet or Planet assemblies with a plutonium core would be typical of worker impacts during accident conditions.

Facility operating procedures prohibit personnel from being in the test facility during remote operation of the Comet or Planet assemblies. If an accident occurs during a test run due to improper experiment setup and/or a combination of operator errors from the control room, the involved workers would be in the remote-control room and no workers would be present in the test facility. Workers in the remote-control room would be protected by a combination of shielding and distance from the immediate impacts of the accident. The remote-control room engineered safety features and/or protective actions taken by the control-room staff to limit contamination of the control-room environment would protect the involved workers.

In the event that workers in the bay area setting up the test initiate a criticality accident, it is anticipated these workers would be subject to serious injury or fatality as a result of the accident. Since the facility operating procedures would not prohibit workers from being in adjacent areas during operations, it is anticipated that workers in the vicinity outside of the bay would receive an estimated dose of less than 200 millirem after an uncontrolled criticality event. (This is estimated based on the potential energy released during this accident in relation to that used to design the shielding requirements.)

Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional risk of radiological injury.

5.3.11 Environmental Justice

Construction Impacts—There would be no disproportionately high and adverse environmental impacts on minority and low-income populations due to construction under the SNL/NM Alternative. As stated in other subsections of Section 5.3, environmental impacts from construction would be small and would not expected be to extend beyond the SNL/NM site boundary.

Operational Impacts—No disproportionately high and adverse environmental impacts on minority and low-income populations would occur under the SNL/NM Alternative. This conclusion is a result of analyses presented in this EIS that determined there were no significant impacts on human health, ecological, cultural, paleontological, socioeconomic, and other resource areas described in other subsections of Section 5.3

During normal operations, approximately 10 curies of the noble gas argon-41 could be activated in the atmosphere. The impacts measured in terms of latent cancer fatalities on the general population would be small, as indicated in Table 5–22. Additionally, subsistence consumption of crops and wildlife radiologically contaminated with argon 41 would not be harmful since argon-41 has a half-life of 1 hour and 48 minutes and decays into a stable isotope of potassium that is not harmful to human health in small quantities.

Columns 2 and 3 of Table 5–24 show the radiological risks to the maximally exposed offsite individual and offsite population, respectively, that could result from postulated accidents under the SNL/NM Alternative. All of these risks are at least six orders of magnitude less than one latent cancer fatality. Hence, none of the postulated accidents would pose a significant radiological risk to the public, including minority and low-income individuals and groups within the population at risk.

5.3.12 Waste Management

In accordance with the Records of Decision for the *Waste Management PEIS* (DOE 1997a), waste could be treated and disposed of on site at SNL/NM or at other DOE sites or commercial facilities. Based on the Record of Decision for hazardous waste published on August 5, 1998 (63 FR 41810), nonwastewater hazardous waste will continue to be treated and disposed of at offsite commercial facilities. Based on the Record of Decision for low-level radioactive waste and mixed low-level radioactive waste published on February 18, 2000 (65 FR 10061), minimal treatment of low-level radioactive waste will be performed at all sites, and to the extent practicable, onsite disposal of low-level radioactive waste will continue. Hanford and NTS will be made available to all DOE sites for disposal of low-level radioactive waste. Mixed low-level radioactive waste analyzed in the *Waste Management PEIS* will be treated at Hanford, INEEL, the Oak Ridge Reservation, and the Savannah River Site and will be disposed of at Hanford and NTS.

It is assumed in this EIS that low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous waste would be treated, stored, and disposed of in accordance with current and developing site practices. No high-level radioactive or transuranic waste is generated from the activities conducted for the TA-18 missions.

Construction Impacts—As previously discussed in Section 4.3.12.1 of this EIS, several environmental restoration sites are located at TA-V. If it is determined that any of these environmental restoration sites or any contaminated soils or other media requiring remediation extend into the construction area, further actions, including appropriate documentation, would be completed under the environmental restoration program. Therefore, potential waste generated from such remediation activities is not included in the *TA-18 Relocation EIS* analyses.

Only low-level radioactive and nonhazardous waste types are expected to be generated from the construction of the new underground facility building and modification of existing buildings at TA-V within SNL/NM. The impacts on the SNL/NM waste management systems, in terms of managing the waste, are discussed in this section. Radiological and chemical impacts on workers and the public from waste management activities are included in the public and occupational health and safety impacts provided in Section 5.3.10.

Low-level radioactive waste generated from construction activities would be sent to the Radioactive and Mixed Waste Management Facility in TA-III for processing to meet the waste acceptance criteria of DOE offsite disposal facilities. About 6.3 cubic meters (8.3 cubic yards) of low-level radioactive waste would be generated from these construction activities (SNL/NM 2001b). This waste represents about 0.08 percent of the low-level radioactive waste storage capacity of the Radioactive and Mixed Waste Management Facility at TA-III—8,000 cubic meters (10,000 cubic yards). The impacts of managing this waste at SNL/NM would be minimal.

Solid nonhazardous waste generated from construction activities would be transferred to the Solid Waste Transfer Facility for screening to remove any potential hazardous waste and then sent to the Rio Rancho Sanitary Landfill in Rio Rancho, New Mexico, for disposal. About 61 cubic meters (80 cubic yards) of solid nonhazardous waste would be generated from the construction activities (SNL/NM 2001b). The impacts of managing this waste at SNL/NM would be minimal.

Sanitary wastewater generated during construction activities would be managed using portable toilet systems.

Operations Impacts—The expected generation rates of waste at SNL/NM associated with relocating the TA-18 operations to a new location at SNL/NM are compared with SNL/NM's treatment, storage, and disposal capacities in **Table 5–25**. The impacts on the SNL/NM waste management systems, in terms of managing the waste, are discussed in this section. Radiological and chemical impacts on workers and the public from waste management activities are included in the public and occupational health and safety impacts provided in Section 5.3.10.

Solid low-level radioactive waste generated from TA-18 activities conducted at the new location in SNL/NM would be sent to the Radioactive and Mixed Waste Management Facility at TA-III for processing to meet the waste acceptance criteria of DOE offsite disposal facilities. Approximately 3,600 cubic meters (4,700 cubic yards) of low-level radioactive waste would be generated from these operations activities over the 25-year operating period. This total waste represents about 45 percent of the low-level radioactive waste storage capacity of the Radioactive and Mixed Waste Management Facility at TA-III — 8,000 cubic meters (10,000 cubic yards). However, because low-level radioactive waste generated by SNL/NM is generally transported off site to appropriate DOE-approved disposal facilities, such as NTS (DOE 1999d), this waste is not expected to be managed in long-term storage. The impacts of managing this waste at SNL/NM would be minimal.

Mixed low-level radioactive waste generated from TA-18 activities conducted at a new location in SNL/NM would be treated, if possible, at the Radioactive and Mixed Waste Management Facility and the High-Bay Mixed Waste Storage Facility, and the treatment residues would be shipped to a commercial or DOE disposal facility. Waste that cannot be treated on site would be shipped off site to a commercial or DOE treatment and disposal facility. The mixed low-level radioactive waste generated from TA-18 activities would be managed in accordance with the SNL/NM site treatment plan. About 38 cubic meters (50 cubic yards) of mixed low-level radioactive waste would be generated over the 25-year operating period of conducting TA-18 activities at SNL/NM. This waste represents about 0.32 percent of the mixed low-level waste storage capacity at SNL/NM—11,866 cubic meters (15,520 cubic yards)—and about 0.002 percent of the mixed low-

level radioactive waste annual treatment capacity at SNL/NM—61,326 cubic meters (80,214 cubic yards) per year. The impacts of managing this waste at SNL/NM would be minimal.

Table 5–25 Operations Waste Management Impacts under the SNL/NM Alternative

Waste Type [a]	*Estimated Waste Generation for TA-18 Mission Operations (cubic meters per year)*	*Estimated Waste Generation as a Percent of* [b]		
		Onsite Treatment Capacity	*Onsite Storage Capacity*	*Onsite Disposal Capacity*
Low-level radioactive waste				
Liquids	0	0	0	0
Solids	145	Not applicable	45	Not applicable
Mixed low-level radioactive waste				
Liquids	0	0	0	0
Solids	1.5	0.002	0.32	Not applicable
Hazardous waste				
Liquids	0	0	0	0
Solids	4 (4,000 kilograms per year)	Not applicable	Not applicable	Not applicable
Nonhazardous waste				
Sanitary wastewater	6,900 [c]	(d)	Not applicable	(d)
Solids	0	0	0	0

[a] See definitions in Chapter 8.
[b] The estimated amounts of waste generated annually are compared with the annual site treatment capacities. The estimated total amounts of waste generated over the assumed 25-year operating period are compared with the site storage and disposal capacities.
[c] Based on the assumption of 100 workers generating 50 gallons per day.
[d] This sanitary wastewater would be sent to the Albuquerque sanitary sewer system.
Note: To convert from cubic meters per year to cubic yards per year, multiply by 1.308; to convert from kilograms to pounds, multiply by 2.2.
Not applicable (i.e., the majority of this waste is not routinely treated, stored, or disposed of on site, or is not held in long-term storage).

Hazardous waste generated from TA-18 activities conducted at a new location in SNL/NM would be sent to the Hazardous Waste Management Facility, located at TA-II, for packaging and short-term (less than one year) storage. This waste would then be shipped off site to RCRA-permitted commercial facilities for recycling, treatment, and disposal. The annual estimate of 4,000 kilograms (8,800 pounds) per year represents about 2.5 percent of the annual hazardous waste generation rate—158,965 kilograms (350,000 pounds) per year for the entire SNL/NM site. The impacts of managing this waste at SNL/NM would be minimal.

Sanitary wastewater generated as a result of TA-18 activities conducted at a new location in SNL/NM would be sent to the Albuquerque sanitary sewer system. Approximately 6,900 cubic meters (9,000 cubic yards) per year of sanitary wastewater would be generated from relocating TA-18 missions to SNL/NM. The impacts of managing this waste would be minimal.

5.3.13 Transportation Impacts

The transportation impact analysis was carried out as described in Appendix D. Under the SNL/NM Alternative, approximately 92 shipments of radioactive materials from TA-18 would be relocated to SNL/NM. The total distance traveled on public roads by trucks carrying radioactive materials would be 31,000 kilometers (19,000 miles).

Incident-Free Transportation Impacts—The dose to transportation workers from all transportation activities under this alternative was calculated at 0.025 person-rem; the dose to site workers involved in packaging and

loading at TA-18 and unloading and unpacking at SNL/NM was calculated at 2.3 person-rem; and the dose to the public was calculated at 0.0009 person-rem. Accordingly, incident-free transportation of radioactive material would result in 0.000010 latent cancer fatalities among transportation workers; 0.004 latent cancer fatalities among site workers; and 0.000020 latent cancer fatalities in the total affected population over the duration of the transportation activities. The number of nonradiological fatalities from vehicular emissions associated with this alternative was calculated to be 0.00020.

Transportation Accidents Impacts—Estimates of total transportation accident risks under the SNL/NM Alternative are as follows: a collective dose to the affected population of 7.0×10^{-6} person-rem, resulting in 3.5×10^{-9} latent cancer fatalities; a traffic accident, resulting in 0.000023 traffic fatalities; and a dose of 139 rem to a hypothetical maximally exposed individual located 33 meters (108 feet) directly downwind from a most severe accident (Severity Category 8) with a release frequency of 5×10^{-8} per year, leading to a risk of 0.07 of developing a latent cancer fatality.

5.3.14 Cumulative Impacts

The projected incremental environmental impacts of implementing the proposed action at SNL/NM were added to the environmental impacts of other present and reasonably foreseeable actions at or near SNL/NM to obtain cumulative site impacts under normal operations. The cumulative impact analysis presented in Chapter 6 of the *SNL/NM SWEIS* (DOE 1999d) discusses the separate contributory effects from seven other DOE facilities, the U.S. Department of Defense (DOD) activities at KAFB, and activities in the region surrounding SNL/NM, including the contributory effects of the Cobisa Power Station. The seven additional DOE facilities are the DOE Albuquerque Operations Office; Energy Training Complex; Transportation Safeguards Division; Nonproliferation and National Security Institute; Ross Aviation, Inc.; Lovelace Respiratory Research Institute; and Federal Manufacturing & Technology/New Mexico (also known as AlliedSignal). For more detailed descriptions and discussions of the contributory effects from ongoing actions at SNL/NM, KAFB, and the region surrounding SNL/NM, refer to Chapter 6 of the *SNL/NM SWEIS*. Impacts from these and other ongoing actions at SNL/NM have been included in the affected environment baseline conditions described for SNL/NM and presented in Chapter 4, Section 4.3.

Impacts from other reasonably foreseeable future actions at SNL/NM include those presented in the *SNL/NM SWEIS*, the *Environmental Assessment for the Microsystems and Engineering Sciences Applications Complex* (DOE 2000f), and the *Environmental Assessment for the Sandia Underground Reactor Facility* (DOE 2001d), which are described along with other relevant NEPA reviews in Sections 1.4.1.8, 1.4.1.12, and 1.4.1.15, respectively. The proposed action for the Microsystems and Engineering Sciences Applications Complex involves renovation of and upgrades to the Microelectronics Development Laboratory; construction of three new facilities; relocation of the activities currently conducted at the Compound Semiconductor Research Laboratory and several other buildings to new facilities; and demolition of the Compound Semiconductor Research Laboratory building. The proposed action for the Sandia Underground Reactor Facility consists of building an underground facility to house the existing Sandia Pulsed Reactors, discontinue use of the existing facility, and provide storage for SNM. Impacts from these actions were factored into estimates of total cumulative impacts, where possible, for the potentially affected resource areas presented in this section.

Cumulative transportation impacts were determined by analyzing the impacts along the various routes used to transport the materials associated with relocated TA-18 activities over the 25-year operating period. The methodology for assessing cumulative impacts is presented in Appendix F.

In this section, cumulative site impacts are presented only for those "resources" at a site that reasonably may be expected to be affected by the proposed action. These include site employment, electrical consumption, water usage, air quality, waste management, and public and occupational health and safety. This section also includes the cumulative impacts associated with intersite transportation.

Resource Requirement Impacts—Cumulative impacts on key resource requirements at SNL/NM would be small. Use of all major resources would remain within the SNL/NM site capacity. The proposed relocation of TA-18 operational capabilities and materials would require an increase in the site's use of electricity and water of approximately 2 percent and 0.1 percent, respectively. Cumulatively with the addition of the TA-18 operations and the proposed action for the Microsystems and Engineering Sciences Application Complex and Sandia Underground Reactor Facility, SNL/NM would use about 48 percent of the available electrical capacity and 58 percent of the available water capacity. Site employment could increase by approximately 20 workers.

Air Quality Impacts—The *SNL/NM SWEIS* considered the incremental effects of ongoing and reasonably foreseeable future actions at SNL/NM, KAFB, and the Cobisa Power Station in evaluating cumulative impacts at SNL/NM. Background ambient air pollutant concentrations previously described in Chapter 4 of this EIS include impacts from KAFB and the Cobisa Power Station. Reasonably foreseeable future actions at SNL/NM and KAFB through 2008, evaluated in the *SNL/NM SWEIS* cumulative impacts section, would result in an increase in one-hour carbon monoxide concentrations of about 398 micrograms per cubic meter and an increase in three-hour sulfur dioxide concentrations of about 28 micrograms per cubic meter. Conversely, changes in these activities are projected to result in some decrease in air pollutant concentrations for other averaging periods for carbon monoxide, sulfur dioxide, and other criteria pollutants. In addition, the increase in SNL/NM and KAFB commuter traffic is expected to result in a 13.3 percent increase in carbon monoxide emissions from highway sources within Bernalillo County in 2005. Although there have been small changes in monitored concentrations for certain pollutants from the 1996 data used in the *SNL/NM SWEIS* cumulative impacts analysis, the conclusion of that analysis remains unchanged. The contributions from TA-18 operations and the proposed action for the Microsystems and Engineering Sciences Application Complex and Sandia Underground Reactor Facility to overall site concentrations are expected to be small. SNL/NM is currently in compliance with all Federal and state ambient air quality standards and would continue to remain in compliance, even after including the cumulative effects of all reasonably foreseeable activities.

Radionuclide emissions at SNL/NM would increase from both the relocated TA-18 operational capabilities and materials and the proposed new Sandia Underground Reactor Facility. As previously described in Section 5.3.3.2 of this EIS, approximately 10 curies per year of argon-41 would be released from relocated TA-18 security Category I/II operations at SNL/NM. In addition, 238 curies per year of argon-41 would potentially be released from the proposed new Sandia Underground Reactor Facility if the reactors were allowed to operate at their maximum allowable production rate (DOE 2001d). The cumulative impact of 248 curies per year of argon-41 at SNL/NM measured in terms of latent cancer fatalities on the general population would be small. Additionally, subsistence consumption of crops and wildlife radiologically contaminated with argon-41 would not be harmful since argon-41 has a half-life of 1 hour and 48 minutes and decays into a stable isotope of potassium that is not harmful to human health in small quantities.

Public and Occupational Health and Safety – Normal Operations Impacts—Cumulative impacts in terms of radiation exposure to the public and workers at SNL/NM were considered for present and reasonably foreseeable activities. The impact from the proposed action for the Microsystems and Engineering Sciences Application Complex has been determined to be minimal (DOE 2000f). In addition, the impact from the proposed new Sandia Underground Reactor Facility was also determined to result in no substantial increase risk to workers and the public (DOE 2001d). With the addition of the impacts from relocated TA-18

operational capabilities and materials at SNL/NM, the cumulative impacts would still be negligible. There would be no increase expected in the number of latent cancer fatalities in the population from site operations if TA-18 security Category I/II operations were to be relocated to SNL/NM. The dose limits for individual members of the public are given in DOE Order 5400.5. As discussed in that order, the dose limit from airborne emissions is 10 millirem per year, as required by the Clean Air Act; the dose limit from drinking water is 4 millirem per year, as required by the Safe Drinking Water Act; and the dose limit from all pathways combined is 100 millirem per year. Therefore, the dose to the maximally exposed offsite individual would be expected to remain well within regulatory limits. Onsite workers would be expected to have an increase of approximately 0.004 latent cancer fatalities due to radiation from TA-18 operations over the 25-year operating period.

Waste Management Impacts—As presented in Section 5.3.12, relocation of TA-18 operational capabilities and materials at SNL/NM would not generate more than a small amount of additional waste at the site. Similarly, impacts associated with the proposed action for the Microsystems and Engineering Sciences Application Complex are also projected to be small (DOE 2000f). In addition, the proposed new Sandia Underground Reactor Facility would generate radioactive waste up to 25 percent over that generated by the current Sandia Pulse Reactor Facility; however, some of this waste would be offset by decreases in radioactive waste generation at storage facilities whose contents would be relocated to the new facility. The additional low-level radioactive waste represents a minor increase, and would not adversely affect SNL/NM's waste management system (DOE 2001d). The cumulative impacts of these actions at SNL/NM are expected to be minimal. It is unlikely that there would be major impacts on waste management at SNL/NM because sufficient capacity exists to manage the site waste.

Transportation Impacts—The cumulative impacts from transportation associated with the relocation of TA-18 operational capabilities and materials are identified in Appendix D. Because likely transportation routes cross many states, cumulative impacts are compared on a national basis. Under the SNL/NM Alternative assessed in this *TA-18 Relocation EIS*, occupational radiation exposure to transportation workers and exposure to the public are estimated to represent less than 0.01 percent of the cumulative exposures from nationwide transportation (DOE 2002). No additional traffic fatality is expected; the incremental increase in traffic fatalities would be less than 0.0001 percent per year.

5.4 NTS ALTERNATIVE

Section 5.4 discusses the environmental impacts associated with the relocation of the TA-18 operational capabilities and materials to NTS. As discussed in Section 3.3.5, the relocation involves only security Category I/II activities. The environmental impacts associated with the relocation of SHEBA and other security Category III/IV activities are discussed separately in Section 5.6.

Under the NTS Alternative, the TA-18 security Category I/II activities would be relocated to the existing Device Assembly Facility (DAF) at NTS Area 6, which would be modified internally to accommodate the activities. The alternative also involves the construction of new buildings at NTS to support the security Category I/II activities (see Section 3.3.5). The Expanded Use Alternative presented in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (NTS SWEIS)* (DOE 1996d) provides the baseline from which incremental effects of the proposed action at NTS are measured.

5.4.1 Land Resources

5.4.1.1 Land Use

Construction Impacts—Under this alternative, a new Low-Scatter Building would be built on 0.6 hectares (1.4 acres) of undisturbed land located just to the west of the DAF complex. A roadway and utility access to this new facility would be another 0.2 hectares (0.5 acres) of land. A new Administration Building would also be built under this alternative. It would occupy 0.1 hectares (0.3 acres) of previously disturbed land adjacent to DAF. Both new structures would be within a portion of NTS that has a Defense Industrial Zone land-use designation (see Section 4.4.1.1). In addition to new construction, internal modifications also would be made to DAF. Both the new construction and modifications to DAF would be compatible with the area's current land use and with its present land-use designation.

Operations Impacts—Operations of new facilities and DAF for relocated TA-18 operations would be compatible with the current land-use designation of the area. Thus, there would be no impact on land use during the operational phase of the proposed action.

5.4.1.2 Visual Resources

Construction Impacts—Activities related to the construction of a new Low-Scatter Building and Administration Building would result in a change to the visual appearance of the DAF area due to the presence of construction equipment and possibly increased dust. These changes would be temporary and, due to the isolated location of the area, would not be visible from areas beyond NTS. Modifications to DAF required to support TA-18 operations would be internal and, thus, would not result in any change to the visual appearance of the facility during construction.

Operations Impacts—The new Low-Scatter and Administration Buildings would represent a change in the appearance of the DAF area. However, these changes would be consistent with current development in the area and, as noted above, would not be visible by the public from any location beyond the NTS boundary. Modifications to DAF would not result in any change to the appearance of the structure. Thus, the current Class IV Bureau of Land Management Visual Resource Management rating of the area would not change as a result of the proposed action.

5.4.2 Site Infrastructure

Construction Impacts—The projected demands on key site infrastructure resources associated with site construction under this alternative on an annualized basis are presented in **Table 5–26**. Existing NTS infrastructure would easily be capable of supporting the requirements associated with DAF modifications and construction of new support buildings at NTS Area 6 proposed under this alternative without exceeding site capacities. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, fuel would be procured from either current DAF inventories or possibly offsite sources and, therefore, would not be a limited resource. Nevertheless, fuel usage during construction is not expected to exceed current DAF usage. Impacts on the local transportation network are expected to be negligible.

Table 5–26 Annual Site Infrastructure Requirements for Facility Construction under the NTS Alternative

Resource	*Available Site Capacity* [a]	*NTS Alternative* [b]	
		Requirement	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	75,467	16	0.02
Peak load (megawatts)	18	0.012	0.07
Fuel			
Natural gas (cubic meters per year)	Not applicable	0	Not applicable
Gasoline and diesel fuel (liters per year) [c]	Not limited	Negligible	Not limited
Water (liters per year)	4,318,000,000	3,975,000	0.09

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 4–36, *TA-18 Relocation EIS*.
[b] Represents total rather than annualized values, as the projected period of construction is only nine months.
[c] Not limited due to offsite procurement.
Sources: Table 4–36, *TA-18 Relocation EIS*; NTS 2001.

Operations Impacts—Resources needed to support operations under the NTS Alternative are presented in **Table 5–27**. It is projected that existing NTS and DAF infrastructure resources would be adequate to support proposed mission activities over 25 years.

Table 5–27 Annual Site Infrastructure Requirements for Facility Operations under the NTS Alternative

Resource	*Available Site Capacity* [a]	*NTS Alternative* [b]	
		Requirement	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	75,467	146	0.2
Peak load (megawatts)	18	0.08	0.4
Fuel			
Natural gas (cubic meters per year)	Not applicable	0	Not applicable
Liquid fuels (liters per year) [c]	Not limited	Negligible	Not limited
Coal (metric tons per year)	Not applicable	0	Not applicable
Water (liters per year)	4,318,000,000	6,900,000	0.2

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 4–36, *TA-18 Relocation EIS*.
[b] Reflects additional demand within Area 6 in excess of current DAF requirements.
[c] Not limited due to offsite procurement.
Sources: Table 4–36, *TA-18 Relocation EIS*; NTS 2001.

5.4.3 Air Quality

5.4.3.1 Nonradiological Releases

Construction Impacts—Construction of new buildings and modification of the existing DAF at NTS Area 6 would result in an increase in air quality impacts from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations for construction were modeled and compared to the most stringent standards (see **Table 5–28**). The maximum ground-level concentrations that would result from construction would be well below the ambient air quality standards. The maximum concentrations would occur at the site boundary along U.S. Route 95 south of DAF for short-term concentrations and east-southeast of DAF for annual concentrations. Modeling of construction air quality considered particulate emissions from activity in a construction area of 0.9 hectares (2.2 acres) for security Category I/II activities and emissions from

various earthmoving and materials-handling equipment. For the purpose of analysis, construction equipment emissions at NTS were assumed to be similar to the site work and new construction emissions at LANL (TA-18) for the TA-18 Upgrade Alternative.

Table 5–28 Nonradiological Air Quality Concentrations at the Site Boundary under the NTS Alternative – Construction

	Averaging Period	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 Hours 1 Hour	10,000 40,000	0.79 6.32
Nitrogen dioxide	Annual	100	0.001
PM_{10}	Annual 24 Hours	50 150	0.007 1.08
Sulfur dioxide	Annual 24 Hours 3 Hours	80 365 1,300	less than 0.001 0.024 0.19

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The National Ambient Air Quality Standards (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.

[b] The concentrations were analyzed at locations to which the public has access—the site boundary and nearby sensitive areas.

Sources: 40 CFR 50, NTS 2001.

Operations Impacts—Under the NTS Alternative, criteria and toxic air pollutants would be generated from the operation of the emergency diesel generators and other activities at NTS Area 6. The emissions are generated from diesel generators currently in operation and would be considered as part of the baseline concentrations (see Section 4.4.3.1). No increases in emissions or air pollutant concentrations are expected under this alternative. Therefore, a Prevention of Significant Deterioration increment analysis is not required (see Appendix F, Section F.3.1). In addition, NTS is located in an attainment area for criteria air pollutants; therefore, no conformity analysis is required (see Appendix F, Section F.3.2).

5.4.3.2 Radiological Releases

Construction Impacts—While no radiological releases to the environment are expected in association with construction activities at DAF, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contamination and would be required to remediate any contamination in accordance with procedures established under NTS's environmental restoration program.

Operations Impacts—Approximately 10 curies per year of argon-41 would be released from the relocated TA-18 operations at the NTS DAF (see Section 3.2.1). There would be no other radiological releases from the relocated mission activities. Impacts from radiological releases are described in Section 5.4.10.1.

5.4.4 Noise

Construction Impacts—Construction of new facilities and modification of DAF at NTS Area 6 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of operation of construction equipment. There would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments along routes leading to

NTS. Noise sources associated with construction at NTS Area 6 are not expected to include loud impulsive sources such as blasting.

Operations Impacts—Noise impacts from operations of the new buildings at NTS Area 6 are expected to be similar to those from existing operations at Area 6. Although there would be a small increase in traffic and equipment noise (e.g., heating and cooling systems, generators, etc.) near the area, there would be little change in noise impacts on wildlife and little increase in noise impacts on the public outside of NTS as a result of moving security Category I/II activities to NTS.

5.4.5 Geology and Soils

Construction Impacts—Construction under this alternative is expected to disturb a total of 0.9 hectares (2.2 acres) of land. Although some aggregate and other geologic resources (e.g., sand) likely would be required to support construction activities in Area 6, these resources are abundant throughout NTS and surrounding areas. Because blasting should not be necessary, as the area is underlain by alluvium, and the land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor overall. A site survey and foundation study would be conducted as necessary to confirm site geologic characteristics for facility engineering purposes. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and remediation required in accordance with procedures established under the site's environmental restoration program.

As discussed in Section 4.4.5, NTS is located in a region with relatively high seismicity. Ground shaking of Modified Mercalli Intensity VII (see Appendix F, Table F–6) associated with postulated earthquakes is possible and supported by the historical record for the region. Further, minor to moderate earthquakes have been epicentered within the site within the last decade. Modified Mercalli Intensity VII ground shaking would be expected to affect primarily the integrity of inadequately designed or nonreinforced structures, but damage to properly or specially designed or upgraded facilities would not be expected. Nevertheless, three potentially active fault systems intersect the site and, thus, should be considered capable. The closest capable fault (Cane Spring) is located about 5 kilometers (3 miles) southeast of DAF. The potential for other large-scale geologic hazards to affect Area 6 facilities is generally low.

As stated in DOE Order 420.1, DOE is required to ensure that nuclear and nonnuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

Operations Impacts—The operations of new and modified buildings under this alternative would not be expected to result in impacts on geologic and soil resources at NTS. As discussed above, the proposed new support buildings and modifications to DAF would be evaluated, designed, and constructed in accordance with DOE Order 420.1 and sited to minimize the risk from geologic hazards. Thus, site geologic conditions would not likely affect the facilities.

5.4.6 Water Resources

5.4.6.1 Surface Water

Construction Impacts—Surface water would not be used to support the construction of new buildings or modifications of DAF at NTS Area 6. Groundwater is the source of water at NTS. There are no natural surface water bodies in the vicinity of DAF that are a viable source of water. Therefore, there would be no construction impact on surface water availability. Sanitary wastewater would be generated by construction

personnel. As plans include the use of portable toilets, there would be no onsite discharge of sanitary wastewater and no impact on surface waters. Waste generation and management activities are detailed in Section 5.4.12.

The potential for storm-water runoff from construction areas to impact downstream surface water quality is small. Although runoff from the vicinity of the site drains toward Frenchman Lake, which has standing water during the winter months, surface drainages in the vicinity of DAF and on the site in general are ephemeral, and runoff infiltration is rapid on alluvium. In addition, Frenchman Lake is located some 16 kilometers (10 miles) southeast of the site. Therefore, any effects on runoff quality would likely be very localized and of short duration. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) and spill prevention practices would be employed during construction to minimize suspended sediment and material transport and potential water quality impacts. No floodplains have been mapped for DAF and the vicinity. Nevertheless, the current DAF is protected from flooding posed by sheet-flow runoff from heavy precipitation events and/or rising playa water levels by a storm-water conveyance and diversion structure. Similar safeguards would be constructed as necessary for the proposed new DAF support buildings and would be sited in accordance with applicable regulatory requirements and DOE orders (e.g., DOE Order 420.1), including Executive Order 11988, *Floodplain Management*.

Operations Impacts—No impacts on surface water resources are expected as a result of operations at DAF. No surface water would be used to support facility activities, and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of operations stemming from staff use of lavatory, shower, and break-room facilities and from miscellaneous potable and sanitary uses. Nevertheless, it is planned that this wastewater would be collected and conveyed to existing wastewater treatment facilities. In addition, no industrial or other NPDES-regulated discharges to surface waters are anticipated. Waste generation and management activities are detailed in Section 5.4.12. Overall, operational impacts on site surface waters and downstream water quality would be expected to be negligible.

5.4.6.2 Groundwater

Construction Impacts—Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and to meet the potable and sanitary needs of construction employees. Water use by construction personnel would be greatly reduced over that normally required by the proposed use of portable toilets. In addition, concrete and the water required for concrete mixing would likely be procured off site. As a result, it is estimated that construction activities would require approximately 4 million liters (1.06 million gallons) of groundwater on an annualized basis (see Table 5–26), mainly to support new facility construction and renovations to existing facilities. It is currently anticipated that this water would be derived from the Area 6 groundwater distribution system serving DAF via a temporary service connection or trucked to the point of use, especially during the early stages of construction. The relatively small volume of groundwater required during the period of construction compared to site availability and historic usage indicates that construction withdrawals should not have an additional impact on regional groundwater levels or availability. As the depth of groundwater is generally greater than 280 meters (920 feet), construction dewatering would not be required.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls, countermeasures, and procedures would be employed to minimize the chance for petroleum, oils, lubricants, and other materials used during construction to be released to the surface or subsurface and to ensure that waste materials are properly disposed of. Waste generation and management activities are detailed in Section 5.4.12. In general, no impact on groundwater availability or quality is anticipated.

Operations Impacts—Activities at DAF under the NTS Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel, as well as for miscellaneous building mechanical uses. It is estimated that about 6.9 million liters (1.8 million gallons) of water would be required annually for facility operations. As this demand would be a small fraction of existing NTS usage and would not exceed site availability (see Table 5–27), no additional measurable impact on regional groundwater levels or availability would be anticipated.

No sanitary or industrial effluent would be directly discharged to the surface or subsurface. Waste generation and management activities are detailed in Section 5.4.12. Thus, no operational impacts on groundwater quality would be expected.

5.4.7 Ecological Resources

5.4.7.1 Terrestrial Resources

Construction Impacts—Under this alternative, a new Low-Scatter Building (including a new roadway and utility access) would be built on 0.8 hectares (1.9 acres) of undisturbed land located just to the west of the DAF complex. A new Administration Building would also be built under this alternative. It would occupy 0.1 hectare (0.3 acres) of previously disturbed land adjacent to DAF. Construction of the Low-Scatter Building would result in the loss of native creosote bush habitat, while construction of the Administration Building would not disrupt natural habitat. The loss of 0.8 hectares (1.9 acres) of creosote bush habitat would represent a very small percentage of this type of habitat, both within the immediate vicinity of DAF and on NTS as a whole (see Section 4.4.7.1).

Wildlife presently using areas proposed for TA-18 operations would be lost or displaced by construction. The loss of creosote bush habitat resulting from construction of the Low-Scatter Building would have minimal effect on wildlife found in the vicinity of DAF, due to the extensive amount of this type of habitat found in the general area and NTS as a whole. Loss and displacement of wildlife resulting from construction of the Administration Building would be expected to be limited due to the developed nature of the site. Noise could cause temporary disruption to wildlife found in areas adjacent to the construction sites; however, these impacts would be temporary. Since all activities would take place within a defined construction zone, direct human disturbance to wildlife and wildlife habitat outside of that zone, such as might be caused by the movement of equipment, would not occur.

Operations Impacts—Operations of facilities associated with relocated TA-18 operations would not adversely impact either wildlife or wildlife habitat at the DAF site because relocated TA-18 operations would not produce emissions at levels that would affect wildlife. The sewage evaporation ponds would receive increased flows as a result of the operations of relocated TA-18 mission support facilities, thus ensuring a continued water supply for wildlife that use the ponds.

5.4.7.2 Wetlands

Construction and Operations Impacts—There are no wetlands located within or adjacent to the areas of NTS which would be disturbed by the newly constructed buildings; therefore, this resource would not be affected during either construction or operations. For the same reason, modifications to DAF required to support TA-18 operations also would not have an impact on wetlands.

5.4.7.3 Aquatic Resources

Construction and Operations Impacts—There are no natural aquatic resources located within or adjacent to the areas of NTS which would be disturbed by the newly constructed buildings; therefore, this resource would not be affected during either construction or operations. For the same reason, modifications to DAF required to support TA-18 operations also would not have an impact on aquatic resources.

5.4.7.4 Threatened and Endangered Species

Construction and Operations Impacts—Under this alternative, construction of new facilities at NTS may impact the federally threatened desert tortoise. Area 6 is located at the northern end of the Mojave Desert tortoise range. Prior to disturbance of land, a preactivity survey would have to be conducted for desert tortoises and their burrows. In addition, transportation during construction might have an impact on desert tortoises because of the increased risk of crushing individual tortoises along the road. However, due to the low population density of the desert tortoise at NTS, it is doubtful that this impact would exceed the allowable losses due to inadvertent taking pursuant to the Biological Opinion for NTS. No other impacts on threatened and endangered species would result from implementation of this alternative. Operations would not impact threatened and endangered species because relocated TA-18 operations would not produce emissions or effluent of quality or at levels that would likely affect these species.

5.4.8 Cultural and Paleontological Resources

5.4.8.1 Prehistoric Resources

Construction and Operations Impacts—The site proposed for constructing the new Administration Building was previously disturbed by construction of the DAF. As such, the likelihood of locating prehistoric resources would be slight. However, the site of the Low-Scatter Building has not been previously disturbed, and the possibility exists that prehistoric resources could be disturbed during construction. A cultural resource survey would be conducted prior to construction. If prehistoric resources were discovered during construction, all work potentially affecting the resources would stop. This work stoppage would be followed by investigations by qualified cultural resource specialists, any coordination necessary with the State Historic Preservation Office, and development and implementation of measures to salvage these resources. The relocation of TA-18 operational capabilities and materials would not affect prehistoric resources under this alternative.

5.4.8.2 Historic Resources

No historic resources have been identified in the immediate vicinity of DAF, although four historic sites have been identified in the Frenchman Flat area (see Section 4.4.8.2). Thus, impacts on historic resources are unlikely to result from the construction of new facilities at the DAF site. A cultural resource survey would be conducted prior to the beginning of construction. The relocation of TA-18 operational capabilities and materials would not affect historic resources under this alternative.

5.4.8.3 Native American Resources

While no prehistoric or historic Native American resources have been located at the DAF site, the Consolidated Group of Tribes and Organizations has identified a number of plant and animal species present within Area 6 that are of cultural importance to Native Americans. Potential impacts on these resources would be expected to be minimal since, as noted in Section 5.4.7.1, impacts on ecological resources resulting from construction and operations of facilities associated with relocated TA-18 operations would be minimal.

As noted in Section 5.4.8.1, if any prehistoric Native American resources were located during construction, work would stop while appropriate action was taken. The relocation of TA-18 operational capabilities and materials would not affect Native American resources under this alternative.

5.4.8.4 Paleontological Resources

Construction and Operations Impacts—Construction and operations of relocated TA-18 mission facilities within the DAF area are unlikely to impact paleontological resources, since no such sites have been identified on NTS. Also, fossils were not found during construction of DAF. Nevertheless, paleontological resources would be included in the scope of the cultural resource survey that would be conducted prior to the beginning of construction.

5.4.9 Socioeconomics

Construction Impacts—Modifications to DAF facilities and construction of new buildings would require a peak construction employment level of 60 workers. This level of employment would generate about 114 indirect jobs in the region around NTS. The potential total employment increase of 174 direct and indirect jobs represents an approximate 0.03 percent increase in the workforce and would occur only over the nine months of construction. It would have no noticeable impact on the socioeconomic conditions of the region of influence.

Operations Impacts—Relocation of TA-18 operational capabilities and materials associated with security Category I/II activities to DAF could result in the permanent relocation or hiring of approximately 20 new employees and a small reduction in employment levels at LANL. This level of employment would generate about 38 indirect jobs in the region around NTS. The potential total employment increase of 58 direct and indirect jobs represents an approximate 0.01 percent increase in the workforce. It would have no noticeable impact on the socioeconomic conditions of the region of influence.

5.4.10 Public and Occupational Health and Safety

The assessments of potential radiological impacts associated with the NTS Alternative are presented in this section. No chemical-related health impacts are associated with any of these alternatives because only very small quantities of industrial-type chemicals, such as ethanol, isopropyl alcohol, magnesium oxide, phenylphosphine, and xylene, would be used. As stated in the *LANL SWEIS* (DOE 1999b), the quantities of these chemicals that could be released to the atmosphere during normal operations are minor and would be below screening levels used to determine the need for additional analysis. There would be no operational increase in the use of these chemicals as a result of the proposed action. No chemicals have been identified that would be a risk to members of the public from construction activities associated with the NTS Alternative. Construction workers would be protected from hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. The potential occupational (industrial) impacts on workers during construction and operations were evaluated based on DOE and Bureau of Labor statistic data, and are detailed in Section C.7 of Appendix C. Construction and operations activities under this alternative are expected to result in some injuries but no fatalities to workers for the duration of the proposed action (i.e., about 3 years of construction and 25 years of operations).

Summaries of radiological impacts from normal operations and postulated accidents are presented below. The methodologies used to determine the impacts on the public and on facility workers are presented in Appendix B. Supplemental information associated with normal operations and postulated accidents is provided in Appendices B and C, respectively.

5.4.10.1 Construction and Normal Operations

Construction Impacts—No radiological risks would be incurred by members of the public from construction activities. Construction workers may be at a small risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as is reasonably achievable.

Operations Impacts—Under this alternative, the only radiological release would be 10 curies per year of argon-41 to the atmosphere from Godiva operations (see Section 5.4.3.2). The associated calculated impacts on the public are presented in **Table 5–29**. The only dose pathway for receptors would be from immersion in the passing plume. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

As shown in the table, the expected annual radiation dose to the maximally exposed offsite individual member of the public would be much smaller than the limit of 10 millirem per year set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a cancer fatality to this individual from annual operations would be approximately 4.4×10^{-11} per year (i.e., about 1 chance in 15 billion per year of a latent cancer fatality). The projected number of fatal cancers to the population within 80 kilometers (50 miles) would be 3.5×10^{-8} per year (i.e., about 1 chance in 23 million per year of a latent cancer fatality).

Table 5–29 Annual Radiological Impacts on the Public from TA-18 Operations at NTS

Receptor	*Impact Values*
Population within 80 Kilometers (50 Miles)	
Collective dose (person-rem)	7.0×10^{-5}
Percent of natural background radiation [a]	1.2×10^{-6}
Cancer fatalities [b]	3.5×10^{-8}
Maximally Exposed Offsite Individual	
Dose (millirem)	8.7×10^{-5}
Percent of regulatory dose limit [c]	8.7×10^{-4}
Percent of natural background radiation [a]	2.7×10^{-5}
Cancer fatalities risk [b]	4.4×10^{-11}
Average Individual within 80 Kilometers (50 Miles)	
Dose (millirem)	3.9×10^{-6}
Percent of natural background radiation [a]	1.2×10^{-6}
Cancer fatalities risk [b]	1.9×10^{-12}

[a] The average annual dose from background radiation at NTS is 314 millirem (see Section 4.4.11.1); the 18,100 people living within 80 kilometers (50 miles) would receive an annual dose of 5,670 person-rem from the background radiation.

[b] Based on a cancer risk estimate of 0.0005 latent cancer fatalities per person-rem (see Appendix B).

[c] This comparison cannot be made for the population and average individual because there is no standard or limit.

Direct radiation doses to the public from operations of the relocated TA-18 critical assembly machines would be limited based on protective and administrative design features of DAF. The dose to any member of the public from direct radiation during critical assembly machine operations at the relocated facilities would essentially be zero.

Annual radiological doses to the 100 workers involved with operations of the relocated TA-18 mission facilities under this alternative would average 100 millirem per worker, for a total workforce annual dose of 10 person-rem. The annual doses to individual workers would be well below the DOE limit of 5,000 millirem (10 CFR 835); the DOE Control Level of 1,000 millirem per year, as established in

10 CFR 835.1002; and the recommended Administrative Control Level of 500 millirem (DOE 1999c). An individual worker's annual risk of a fatal cancer is projected to be 4.0×10^{-5} (i.e., about 1 chance in 25,000 per year of a latent cancer fatality), and the projected number of fatal cancers in the workforce from operations would be 0.0040 per year (or 1 chance in 250 that the workers would experience a fatal cancer per year of operations).

5.4.10.2 Facility Accidents

Under the NTS Alternative, TA-18 operational capabilities and materials would be relocated to DAF. DAF would include safety features that would reduce the risks of accidents that currently exist at LANL under the No Action Alternative. The accident scenarios described for the No Action Alternative at LANL are considered applicable to DAF, with one exception. Accidents associated with SHEBA are excluded because the SHEBA missions would be moved to LANL's TA-39; its impacts are shown in Section 5.6.3.10. Certain scenario parameter values applicable to the No Action Alternative, such as leak path factors, materials at risk, and the corresponding source term, have been adjusted to reflect improved safety features of DAF.

Radiological Impacts—**Table 5–30** shows the frequencies and consequences of the postulated set of accidents for a noninvolved worker and the public (maximally exposed offsite individual and the general population living within 80-kilometers [50 miles] of the facility). **Table 5–31** shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident could occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *TA-18 BIO* (DOE 2001a). The selection process and screening criteria used (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur at TA-18 facilities. Thus, in the event that any other accident not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Consideration has also been given to the possibility of an accident originating with the collocated DAF operations that could initiate an accident at the relocated TA-18 operations at DAF. Because of the robust DAF structure, it was determined that a nuclear yield from DAF operations would be the only accident that could impact the relocated TA-18 operations. However, because of the extremely small likelihood and extremely high consequences of a nuclear yield if it were to occur, the contribution to such consequences of any release at TA-18 operations would be relatively inconsequential.

The accident with the highest risk to the offsite population (see Table 5–31) would be a high-pressure spray fire on a Comet assembly with a plutonium core accident. The increased number of latent cancer fatalities in the offsite population would be 7.7×10^{-10} per year (i.e., about 1 chance in 1.3 billion per year of a latent cancer fatality). The highest risk of a latent cancer fatality to the maximally exposed offsite individual would be 2.5×10^{-12} per year (i.e., about 1 chance in 400 billion per year of a latent cancer fatality). The highest risk of a latent cancer fatality to a noninvolved worker located at a distance of 100 meters (109 yards) from the accident would be 4.0×10^{-9} per year (i.e., about 1 chance in 250 million per year of a latent cancer fatality).

Table 5–30 Accident Frequency and Consequences under the NTS Alternative

		Maximally Exposed Offsite Individual		*Offsite Population* [a]		*Noninvolved Worker*	
	Frequency (per year)	*Dose (millirem)*	*Latent Cancer Fatalities* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (millirem)*	*Latent Cancer Fatalities* [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core accident							
	1.0×10^{-6}	6.3×10^{-5}	3.13×10^{-8}	0.016	8.0×10^{-6}	1.52	0.00061
Bare, fully reflected or moderated metal criticality accident							
	1.0×10^{-4}	2.2×10^{-12}	1.09×10^{-15}	2.5×10^{-10}	1.2×10^{-13}	2.5×10^{-8}	1.0×10^{-11}
High-pressure spray fire on a Comet machine with a plutonium core accident							
	1.0×10^{-6}	0.005	2.5×10^{-6}	1.55	0.00077	10.0	0.004
Earthquake-induced facility failures without fire accident							
	1.0×10^{-4}	2.6×10^{-6}	1.3×10^{-9}	0.00089	4.4×10^{-7}	0.064	2.6×10^{-5}

[a] Based on a population of 18,100 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table 5–31 Annual Cancer Risks Due to Accidents under the NTS Alternative

Accident	*Maximally Exposed Offsite Individual* [a]	*Offsite Population* [b, c]	*Noninvolved Worker* [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	3.1×10^{-14}	8.0×10^{-12}	6.1×10^{-10}
Bare, fully reflected or moderated metal criticality	1.1×10^{-19}	1.2×10^{-17}	1.0×10^{-15}
High-pressure spray fire on a Comet machine with a plutonium core	2.5×10^{-12}	7.7×10^{-10}	4.0×10^{-9}
Earthquake-induced facility failures without fire	1.3×10^{-13}	4.4×10^{-11}	2.6×10^{-9}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 18,100 persons residing within 80 kilometers (50 miles) of the site.

Hazardous Chemicals and Explosives Impacts—There would be no hazardous chemicals or explosives used or stored at the new or modified NTS facilities, other than minor industrial quantities, that would impact workers or the public under accident conditions.

Involved Worker Impacts

Approximately 100 workers would be located at DAF. During criticality experiments, workers would be safely located beyond a prescribed distance from the experiments.

Workers in the vicinity of an accident could be at risk of serious injury or fatality. The impacts from the uncontrolled reactivity insertion on the Comet or Planet assemblies with a plutonium core would be typical of worker impacts during accident conditions.

Facility operating procedures prohibit personnel from being in the test facility during remote operation of the Comet or Planet assemblies. If an accident were to occur during a test run due to improper experiment setup and/or a combination of operator errors from the control room, the involved workers would be in the remote-control room and no workers would be present in the test facility. Workers in the remote-control room would be protected by a combination of shielding and distance from the immediate impacts of the accident. The remote-control room engineered safety features and/or protective actions taken by the control-room staff to limit contamination of the control-room environment would protect the involved workers.

In the event that workers in the bay area setting up the test initiate a criticality accident, it is anticipated these workers would be subject to serious injury or fatality as a result of the accident. Since the facility operating procedures would not prohibit workers from being in adjacent areas during operations, it is anticipated that workers in the vicinity outside of the bay would receive an estimated dose of less than 200 millirem after an uncontrolled criticality event. (This is estimated based on the potential energy released during this accident in relation to that used to design the shielding requirements.)

Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional risk of radiological injury.

5.4.11 Environmental Justice

Construction Impacts—There would be no disproportionately high and adverse environmental impacts on minority and low-income populations due to construction under the NTS Alternative. As stated in other subsections of Section 5.4, environmental impacts from construction would be small and would not be expected to extend beyond the NTS site boundary.

Normal Operations Impacts—No disproportionately high and adverse environmental impacts on minority and low-income populations would occur under the NTS Alternative. This conclusion is a result of analyses presented in this EIS that determined there were no significant impacts on human health, ecological, cultural, paleontological, socioeconomic, and other resource areas described in other subsections of Section 5.4.

During normal operations, approximately 10 curies of the noble gas argon-41 could be activated in the atmosphere. The impacts measured in terms of latent cancer fatalities on the general population would be small, as indicated in Table 5–29. Additionally, subsistence consumption of crops and wildlife radiologically contaminated with argon-41 would not be harmful since argon-41 has a half-life of 1 hour and 48 minutes and decays into a stable isotope of potassium that is not harmful to human health in small quantities.

Columns 2 and 3 of Table 5–31 show the radiological risks to the maximally exposed offsite individual and offsite population, respectively, that could result from postulated accidents under the NTS Alternative. All of these risks are essentially 0. Hence, none of the postulated accidents would pose a significant radiological risk to the public, including minority and low-income individuals and groups within the population at risk.

5.4.12 Waste Management

In accordance with the Records of Decision for the *Waste Management PEIS* (DOE 1997a), waste could be treated and disposed of on site at NTS or at other DOE sites or commercial facilities. Based on the Record of Decision for hazardous waste published on August 5, 1998 (63 FR 41810), nonwastewater hazardous waste will continue to be treated and disposed of at offsite commercial facilities. Based on the Record of Decision for low-level radioactive and mixed low-level radioactive waste published on February 18, 2000 (65 FR 10061), minimal treatment of low-level radioactive waste will be performed at all sites, and, to the extent practicable, onsite disposal of low-level radioactive waste will continue. Hanford and NTS will be made available to all DOE sites for disposal of low-level radioactive waste. Mixed low-level radioactive waste analyzed in the *Waste Management PEIS* will be treated at Hanford, INEEL, the Oak Ridge Reservation, and the Savannah River Site and will be disposed of at Hanford and NTS.

It is assumed in this EIS that low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous waste would be treated, stored, and disposed of in accordance with current and developing site practices. No high-level radioactive or transuranic waste is generated from the activities conducted for the TA-18 operations.

Construction Impacts—Only nonhazardous waste is expected to be generated from the construction activities related to relocation of the TA-18 operational capabilities and materials in and around the existing DAF at NTS. The impacts on the NTS waste management systems, in terms of managing the waste, are discussed in this section. Radiological and chemical impacts on workers and the public from waste management activities are included in the public and occupational health and safety impacts provided in Section 5.4.10.

Solid nonhazardous waste generated from construction activities would be disposed of at the onsite construction and demolition landfill, the 9 U-10c Solid Waste Disposal Site. Approximately 1,000 cubic meters (1,300 cubic yards) of solid nonhazardous waste would be generated from the construction activities (NTS 2001). This waste represents about 0.10 percent of the disposal capacity of the 9 U-10c Solid Waste Disposal Site—990,000 cubic meters (1,300,000 cubic yards).

Sanitary wastewater generated from construction activities would be managed using portable toilets currently located at DAF (NTS 2001).

Operations Impacts—The expected generation rates of waste at NTS associated with the relocation of TA-18 operational capabilities and materials to a new location at NTS are compared with NTS's treatment, storage, and disposal capacities in **Table 5–32**. The impacts on the NTS waste management systems, in terms of managing the waste, are discussed in this section. Radiological and chemical impacts on workers and the public from waste management activities are included in the public and occupational health and safety impacts provided in Section 5.4.10.

Table 5–32 Operations Waste Management Impacts under the NTS Alternative

Waste Type [a]	*Estimated Waste Generation for TA-18 Mission Operations (cubic meters per year)*	*Estimated Waste Generation as a Percent of* [b]		
		Onsite Treatment Capacity	*Onsite Storage Capacity*	*Onsite Disposal Capacity*
Low-Level Radioactive Waste				
Liquids	0	0	0	0
Solids	145	Not applicable	Not applicable	0.72
Mixed Low-Level Radioactive Waste				
Liquids	0	0	0	0
Solids	1.5	Not applicable	3.3	0.002
Hazardous Waste				
Liquids	0	0	0	0
Solids	4 (4,000 kilograms per year)	Not applicable	Not applicable	Not applicable
Nonhazardous Waste				
Sanitary wastewater	6,900 [c]	(d)	Not applicable	(d)
Solids	0	0	0	0

[a] See definitions in Chapter 8.
[b] The estimated amounts of waste generated annually are compared with the annual site treatment capacities. The estimated total amounts of waste generated over the assumed 25-year operating period are compared with the site storage and disposal capacities.
[c] Based on the assumption of 100 workers generating 50 gallons per day.
[d] This sanitary wastewater would be managed using existing septic tank systems.
Not applicable (i.e., the majority of this waste is not routinely treated, stored, or disposed of on site, or is not held in long-term storage).

Solid low-level radioactive waste generated from TA-18 operations at NTS would be sent to the Area 5 Radioactive Waste Management Site for characterization and certification prior to disposal at the Areas 3 and 5 Radioactive Waste Management Site. Approximately 3,600 cubic meters (4,700 cubic yards) of low-level radioactive waste would be generated from these operations activities. This waste represents about

0.72 percent—500,000 cubic meters (650,000 cubic yards)—of the Areas 3 and 5 Radioactive Waste Management Site disposal facility. The impacts of managing this waste at NTS would be minimal.

Mixed low-level radioactive waste generated from TA-18 operations at NTS would be sent to the Area 5 Transuranic Waste Storage Pad for characterization and identification of appropriate treatment. Once the waste meets, or has been treated to meet, land disposal restriction requirements, the waste would be sent to Pit 3 in Radioactive Waste Management Site Area 5 for disposal. The mixed low-level radioactive waste generated from TA-18 operations would be managed in accordance with the NTS site treatment plan. About 38 cubic meters (50 cubic yards) of mixed low-level radioactive waste would be generated over the 25-year operating period of conducting TA-18 mission activities at NTS. This waste represents about 3.3 percent of the mixed low-level radioactive waste storage capacity at NTS—1,150 cubic meters (1,500 cubic yards)—and about 0.002 percent of the mixed low-level radioactive waste disposal capacity at NTS—118,908 cubic meters (160,000 cubic yards). The impacts of managing this waste at NTS would be minimal.

Hazardous waste generated from TA-18 operations at NTS would be sent to the Area 5 RCRA-permitted Hazardous Waste Storage Unit and shipped off site to a commercial RCRA-permitted facility for treatment and disposal. The annual estimate of 4 cubic meters (5 pounds) per year represents about 12 percent of the annual hazardous waste generation rate—34.6 cubic meters (45.2 cubic yards) per year for the entire NTS site. The impacts of managing this waste at NTS would be minimal.

Approximately 6,900 cubic meters (9,000 cubic yards) per year of sanitary wastewater would be generated from the relocation of TA-18 operational capabilities and materials at NTS. This sanitary wastewater would be managed using existing septic tank systems. The impacts of managing this waste at NTS would be minimal.

5.4.13 Transportation Impacts

The transportation impact analysis was carried out as described in Appendix D. Under the NTS Alternative, approximately 92 shipments of radioactive material from TA-18 would be relocated to NTS. The total distance traveled on public roads by trucks carrying radioactive material would be 307,000 kilometers (192,000 miles).

Incident-Free Transportation Impacts—The dose to transportation workers from all transportation activities under this alternative was calculated at 0.25 person-rem; the dose to site workers involved in packaging and loading at TA-18 and unloading and unpacking at NTS was calculated at 2.3 person-rem; and the dose to the public was calculated at 0.33 person-rem. Accordingly, incident-free transportation of radioactive material would result in 0.00010 latent cancer fatalities among transportation workers; 0.0009 latent cancer fatalities among site workers; and 0.00016 latent cancer fatalities in the total affected population over the duration of the transportation activities. The number of nonradiological fatalities from vehicular emissions associated with this alternative was calculated to be 0.00028.

Transportation Accident Impacts—Estimates of total transportation accident risks under the NTS Alternative are as follows: a collective dose to the affected population of 0.000028 person-rem, resulting in 1.4×10^{-8} latent cancer fatalities; a traffic accident, resulting in 0.00020 traffic fatalities; and a dose of 139 rem to a hypothetical maximally exposed individual located 33 meters (108 feet) directly downwind from a most severe accident (Severity Category 8) with a release frequency of 5×10^{-7} per year, leading to a risk of 0.07 of developing a latent cancer fatality.

5.4.14 Cumulative Impacts

The projected incremental environmental impacts of implementing the proposed action at NTS were added to the environmental impacts of other present and reasonably foreseeable future actions at or near NTS to obtain cumulative site impacts under normal operations. Impacts from ongoing actions have been included in the affected environment conditions described for NTS and presented in Chapter 4, Section 4.4.

Impacts from other reasonably foreseeable future actions at NTS include those presented in the *NTS SWEIS* (DOE 1996d) and the *Final Environmental Assessment for Atlas Relocation and Operation at the Nevada Test Site* (DOE 2001c), which are described along with other relevant NEPA reviews in Sections 1.4.1.4 and 1.4.1.14, respectively. The proposed action for the relocation of Atlas to NTS involves the disassembly of the Atlas Facility and machine at LANL and transport to NTS. At NTS, Atlas would be reassembled in a new building within an existing Area 6 Industrial, Research, and Support site. After Atlas is reassembled at NTS, it would be recommissioned to ensure proper operation and then used to conduct approximately 40 pulsed-power experiments each year, with a potential to increase to approximately 100 experiments per year. At full operation, the Atlas Facility is estimated to employ 15 people, mostly engineers and scientists. Impacts from this action were factored into estimates of total cumulative impacts, where possible, for the potentially affected resource areas presented in this section.

Cumulative transportation impacts were determined by analyzing the impacts along the various routes used to transport the materials associated with relocated TA-18 activities over the 25-year operating period. The methodology for assessing cumulative impacts is presented in Appendix F.

In this section, cumulative site impacts are presented only for those "resources" at a site that may reasonably be expected to be affected by the proposed action. These include site employment, electrical consumption, water usage, air quality, waste management, and public and occupational health and safety. This section also includes the cumulative impacts associated with intersite transportation.

Resource Requirement Impacts—Cumulative impacts on key resource requirements at NTS would be very small. Use of all major resources would remain within the NTS site capacity. The proposed relocation of TA-18 missions would require an increase in the site's use of both electricity and water of approximately 0.1 percent. Cumulatively, with the addition of the TA-18 operations and the proposed action for the relocation of Atlas to Area 6, NTS would use about 58 percent of the available electrical capacity and 16 percent of the available water capacity. Site employment could increase by approximately 35 workers.

Air Quality Impacts—NTS is currently in compliance with all Federal and state ambient air quality standards and would continue to remain in compliance, even after including the cumulative effects of relocated activities at TA-18 and Atlas. The contributions of TA-18 operations to overall site concentrations are expected to be very small.

Public and Occupational Health and Safety–Normal Operations Impacts—Cumulative impacts in terms of radiation exposure to the public and workers at NTS were considered for present and reasonably foreseeable activities. The impacts from the proposed action to relocate Atlas to NTS Area 6 have been determined to be minimal (DOE 2001c). With the additional impact from TA-18 operations at NTS, the cumulative impacts would still be negligible. There would be no increase expected in the number of latent cancer fatalities in the population from site operations if TA-18 security Category I/II operations were to be relocated to NTS. The dose limits for individual members of the public are given in DOE Order 5400.5. As discussed in that order, the dose limit from airborne emissions is 10 millirem per year, as required by the Clean Air Act; the dose limit from drinking water is 4 millirem per year, as required by the Safe Drinking Water Act; and the dose limit from all pathways combined is 100 millirem per year. Therefore, the dose to

the maximally exposed offsite individual would be expected to remain well within the regulatory limits. Onsite workers would be expected to have an increase of approximately 0.004 latent cancer fatalities due to radiation from TA-18 operations over the 25-year operating period.

Waste Management Impacts—As presented in Section 5.4.12, relocation of TA-18 operational capabilities and materials at NTS would not generate more than a small amount of additional waste at the site. Similarly, impacts associated with the proposed action for the relocation and operations of the Atlas Facility at Area 6 are also projected to be small, and the cumulative impacts of these combined actions at NTS are expected to be minimal. It is unlikely that there would be major impacts on waste management at NTS because sufficient capacity would exist to manage the site waste.

Transportation Impacts—The cumulative impacts from transportation associated with the relocation of TA-18 operational capabilities and materials are identified in Appendix D. Because likely transportation routes cross many states, cumulative impacts are compared on a national basis. Under the NTS Alternative assessed in this *TA-18 Relocation EIS*, occupational radiation exposure to transportation workers and exposure to the public are estimated to represent less than 0.01 percent of the cumulative exposures from nationwide transportation (DOE 2002). No additional traffic fatality is expected; the incremental increase in traffic fatalities would be less than 0.0001 percent per year.

On July 9, 2002, the U.S. Congress approved the establishment of a geologic repository for the disposal of spent nuclear fuel and high level radioactive waste at Yucca Mountain in Nye County, Nevada. Under this project, starting in 2010 - 2012, the repository is expected to receive, over a 24-year period, both truck and rail shipments of spent nuclear fuel and high level radioactive waste from 72 commercial nuclear power plants and 5 DOE sites. Depending upon the mode of transportation, the repository is expected to receive a range of 10,000 shipments (mostly rail) to 53,000 shipments (mostly truck) (DOE 2002). The calculated risks to the public from incident-free transportation of the spent nuclear fuel and high level radioactive waste to Yucca Mountain would range from 0.81 latent cancer fatalities (rail shipments) to 2.5 latent cancer fatalities (truck shipments). Under the TA-18 Relocation project, there would be 92 truck shipments of SNM (not spent nuclear fuel) to the Nevada Test Site. The corresponding transportation risk to the public from these shipments would be 0.00016 latent cancer fatalities, (see Appendix D, Table D–4). These shipments would occur prior to 2010, before the starting date of any shipments of spent nuclear fuel to Yucca Mountain.

5.5 ANL-W ALTERNATIVE

Section 5.5 discusses the environmental impacts associated with the relocation of the TA-18 operational capabilities and materials to the ANL-W site. As discussed in Section 3.3.6, the relocation involves only the security Category I/II activities. The environmental impacts associated with the relocation of SHEBA and other security Category III/IV activities are discussed separately in Section 5.6.

Under the ANL-W Alternative, the TA-18 security Category I/II activities would be relocated to the existing Fuel Manufacturing Facility (FMF)/Zero Power Physics Reactor (ZPPR) Complex at ANL-W, modified internally to accommodate the activities. The alternative also involves the addition of a new structure to FMF for security Category I/II activities and the internal modification of existing buildings at ANL-W to support the security Category I/II activities (see Section 3.3.6).

5.5.1 Land Resources

5.5.1.1 Land Use

Construction Impacts—Under this alternative, approximately 0.6 hectares (1.5 acres) of land within ANL-W would be disturbed by construction of new facilities. New construction would involve an addition to FMF and a new General-Purpose Experimental Building (GPEB). Since both new buildings would be within the existing PIDAS, their construction would not represent a change in land use at the site. Additionally, relocation of TA-18 operations to ANL-W would involve the use of ZPPR and either the Experimental Breeder Reactor II (EBR-II) or the Transient Reactor Test (TREAT) facility. The use of these facilities for TA-18 operations would involve only internal modification and, therefore, would not represent a change in land use.

Operations Impacts—Current and projected land use within ANL-W is devoted to nuclear and nonnuclear scientific and engineering experiments for DOE, private industry, and academia (see Section 4.5.1.1). The operations of both newly constructed buildings as well as modified existing buildings in support of TA-18 operations would be compatible with current land use at the site. Thus, impacts on land use would not occur during operations.

5.5.1.2 Visual Resources

Construction Impacts—Activities related to the construction of new buildings at ANL-W (i.e., an addition to FMF and a new GPEB), as well as those related to modification of existing buildings (i.e., ZPPR and either EBR-II or TREAT), would result in a change to the visual appearance of the site due to the presence of construction equipment and possibly increased dust. These changes would be temporary and, due to the isolated location of ANL-W, would be unlikely to be visible from areas beyond INEEL.

Operations Impacts— Once operational, new buildings at ANL-W would not be noticeably different than other existing structures and, therefore, would not change the appearance of the site. Modifications to existing buildings would not represent a change in the appearance of the area. Thus, the current Class IV Bureau of Land Management Visual Resource Management rating of ANL-W would not change, and there would be no impact on visual resources at either ANL-W or INEEL.

5.5.2 Site Infrastructure

The projected demands on key site infrastructure resources associated with site construction under this alternative on an annualized basis are presented in **Table 5–33**. The existing INEEL infrastructure would easily be capable of supporting the requirements primarily associated with modifications to existing and operating ANL-W facilities under this alternative without exceeding site capacities. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, fuel would be procured from either current site inventories or off site and, therefore, would not be limiting resource requirements. Impacts on the local transportation network are expected to be negligible.

Operations Impacts—Resources needed to support facility operations under the ANL-W Alternative are presented in **Table 5–34**. It is projected that existing INEEL and ANL-W infrastructure resources would be adequate to support proposed mission activities over 25 years.

Table 5–33 Annual Site Infrastructure Requirements for Facility Construction under the ANL-W Alternative

Resource	*Available Site Capacity* [a]	*ANL-W Alternative* [b]	
		Requirement	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	172,428	13	0.01
Peak load (megawatts)	85	0.03	0.04
Fuel			
Natural gas (cubic meters per year)	Not applicable	0	Not applicable
Gasoline and diesel fuel (liters per year) [c]	10,180,000	Negligible	Negligible
Water (liters per year)	38,171,000,000	49,970	0.0001

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 4–52, *TA-18 Relocation EIS*.
[b] Reflects additional demand in excess of existing ANL-W facilities proposed for use under this alternative.
[c] Low supplies can be replenished by truck.
Sources: Table 4–52, *TA-18 Relocation EIS*; ANL-W 2001.

Table 5–34 Annual Site Infrastructure Requirements for Facility Operations under the ANL-W Alternative

Resource	*Available Site Capacity* [a]	*ANL-W Alternative* [b]	
		Requirement	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	172,428	2,249	1.3
Peak load (megawatts)	85	0.31	0.4
Fuel			
Natural gas (cubic meters per year)	Not applicable	0	Not applicable
Liquid fuels (liters per year) [c]	10,180,000	Negligible	Negligible
Coal (metric tons per year) [c]	0	0	0
Water (liters per year)	38,171,000,000	6,900,000	0.02

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 4–52, *TA-18 Relocation EIS*.
[b] Reflects additional demand in excess of existing ANL-W facilities proposed for use under this alternative.
[c] Low supplies can be replenished by truck.
Sources: Table 4–52, *TA-18 Relocation EIS*; ANL-W 2001.

5.5.3 Air Quality

5.5.3.1 Nonradiological Releases

Construction Impacts—Construction of new buildings and modification of existing buildings at ANL-W would result in an increase in air quality impacts from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations for construction were modeled and compared to the most stringent standards (see **Table 5–35**). The maximum ground-level concentrations that would result from construction would be well below the ambient air quality standards. The maximum concentrations occur along U.S. Highway 20, south of ANL-W. Modeling of construction air quality considered particulate emissions from activity in a construction area of 0.62 hectares (1.5 acres) for security Category I/II activities and emissions from various earthmoving and materials-handling equipment.

Table 5–35 Nonradiological Air Quality Concentrations at the Public Highway under the ANL-W Alternative – Construction

	Averaging Period	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 Hours 1 Hour	10,000 40,000	15.7 121
Nitrogen dioxide	Annual	100	0.007
PM_{10}	Annual 24 Hours	50 150	0.025 1.26
Sulfur dioxide	Annual 24 Hours 3 Hours	80 365 1,300	0.001 1.32 10.5

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The National Ambient Air Quality Standards (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.

[b] The concentrations were analyzed at locations to which the public has access—the site boundary, public highway, and nearby sensitive areas.

Sources: 40 CFR 50, ANL-W 2001.

Operations Impacts—Under the ANL-W Alternative, small quantities of criteria and toxic air pollutants would be generated from the operation of the emergency diesel generators and other activities at ANL-W. The emissions from the generators would be independent of the activities being performed at ANL-W, since they result primarily from periodic testing. **Table 5–36** summarizes the concentrations of criteria pollutants from operation of the diesel generators. The concentrations are compared to their corresponding ambient air quality standards. The maximum concentrations that would result from operations would occur along U.S. Highway 20, south of ANL-W. No major change in emissions or air pollutant concentrations are expected under this alternative. Therefore, a Prevention of Significant Deterioration increment analysis is not required (see Appendix F, Section F.3.1). In addition, ANL-W is located in an attainment area for criteria air pollutants; therefore, no conformity analysis is required (see Appendix F, Section F.3.2).

Table 5–36 Nonradiological Air Quality Concentrations at the Public Highway under the ANL-W Alternative – Operations

	Averaging Period	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 Hours 1 Hour	10,000 40,000	5.27 22
Nitrogen dioxide	Annual	100	0.002
PM_{10}	Annual 24 Hours	50 150	less than 0.001 0.578
Sulfur dioxide	Annual 24 Hours 3 Hours	80 365 1,300	less than 0.001 0.539 3.49

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The National Ambient Air Quality Standards (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.

[b] The concentrations were analyzed at locations to which the public has access—the site boundary, public highway, and nearby sensitive areas.

Sources: 40 CFR 50, ANL-W 2001.

5.5.3.2 Radiological Releases

Construction Impacts—While no radiological releases to the environment are expected in association with construction activities at ANL-W, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contamination and would be required to remediate any contamination in accordance with procedures established under INEEL's environmental restoration program.

Operations Impacts—Approximately 10 curies per year of argon-41 would be released from the relocated TA-18 operations at ANL-W (see Section 3.2.1). There would be no other radiological releases from the relocated mission activities. Impacts from radiological releases are described in Section 5.5.10.1.

5.5.4 Noise

Construction Impacts—Construction of new buildings and modification of existing buildings at ANL-W would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of operation of construction equipment. There would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels along routes leading to INEEL from construction employees and material shipments. Noise sources associated with construction at ANL-W are not expected to include loud impulsive sources such as blasting.

Operations Impacts—Noise impacts from operations of the new facilities at ANL-W are expected to be similar to those from existing operations at ANL-W. Although there would be a small increase in traffic and equipment noise (e.g., heating and cooling systems, generators, etc.) near the area, there would be little change in noise impacts on wildlife and little increase in noise impacts on the public outside of INEEL as a result of moving security Category I/II activities to ANL-W.

5.5.5 Geology and Soils

Construction Impacts—Construction associated with relocation of TA-18 operational capabilities and materials under the ANL-W Alternative is expected to disturb a total of approximately 0.6 hectares (1.5 acres) of land within the current ANL-W perimeter. Although some aggregate and other geologic resources (e.g., sand) likely would be required to support construction activities at ANL-W, these resources are abundant throughout INEEL and the surrounding areas. As blasting should not be necessary (no deep excavation work is anticipated), the overall impact on geologic and soil resources would be relatively minor. A site survey and foundation study would be conducted as necessary to confirm site geologic characteristics for facility engineering purposes. The potential also exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and remediation required in accordance with the procedures established under the site's environmental restoration program.

As discussed in Section 4.5.5, the Eastern Snake River Plain on which INEEL is situated is a region of relatively low seismicity, although higher rates of seismic activity are indicated for regions in the surrounding Basin and Range Physiographic Province. Ground shaking of Modified Mercalli Intensity VI (see Appendix F, Table F–6) has been reported on the site in the recent past associated with a major earthquake epicentered in the Borah Peak Range northwest of INEEL. Otherwise, relatively few and minor earthquakes have occurred in the area surrounding INEEL. Modified Mercalli Intensity VI shaking typically causes only

slight damage to structures, while Modified Mercalli Intensity VII activity would be expected to affect primarily the integrity of inadequately designed or nonreinforced structures, but damage to properly or specially designed or upgraded facilities would not be expected. Nevertheless, two fault segments in the vicinity of INEEL are considered capable. The closest capable fault (the Howe Segment of the Lemhi Fault) is located 31 kilometers (19 miles) northwest of ANL-W. The likelihood of future volcanic activity along the Axial Volcanic Zone during the 25-year project period is considered low. The potential for nontectonic events to affect ANL-W facilities is also low.

As stated in DOE Order 420.1, DOE is required to ensure that nuclear and nonnuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

Operations Impacts—The operations of the new and modified buildings at ANL-W would not be expected to result in impacts on geologic and soil resources at INEEL. As discussed above, the proposed new support building and modifications to existing ANL-W buildings would be evaluated, designed, and constructed in accordance with DOE Order 420.1 and sited to minimize the risk from geologic hazards. Thus, site geologic conditions would not likely affect the facilities.

5.5.6 Water Resources

5.5.6.1 Surface Water

Construction Impacts—Surface water would not be used to support the construction of new support buildings or modifications to or renovations of existing buildings at ANL-W. Groundwater is the source of water at ANL-W and across INEEL. There are no natural surface water drainages or other natural water bodies in the vicinity of ANL-W. Therefore, there would be no construction impact on surface water availability. Sanitary wastewater would be generated by construction personnel. As plans include the use of portable toilets, there would be no onsite discharge of sanitary wastewater and no impact on surface waters. Waste generation and management activities are detailed in Section 5.5.12.

The potential for storm-water runoff from construction areas to impact downstream surface water quality is small. Surface drainages in the vicinity of ANL-W are poorly defined and ephemeral, while infiltration to the subsurface is relatively rapid on unconsolidated sediment. Further, the closest major surface water drainage is more than 20 kilometers (12 miles) west of ANL-W. Any effects on runoff quality would likely be very localized and of short duration. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) and spill prevention practices would be employed during construction to minimize suspended sediment and material transport and potential water quality impacts. ANL-W is not located in an area prone to flooding.

Operations Impacts—No impacts on surface water resources are expected as a result of facility operations at ANL-W under this alternative. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from facility staff use of lavatory, shower, and break-room facilities and from miscellaneous potable and sanitary uses. Nevertheless, it is planned that this wastewater would be collected and conveyed to existing wastewater treatment facilities. In addition, no industrial or other NPDES-regulated discharges to surface waters are anticipated. Waste generation and management activities are detailed in Section 5.5.12. Overall, operational impacts on site surface waters and downstream water quality would be expected to be negligible.

5.5.6.2 Groundwater

Construction Impacts—Water would be required during construction for uses such as dust control and soil compaction, washing and flushing activities, and to meet the potable and sanitary needs of construction employees. Water use by construction personnel would be greatly reduced over that normally required by the proposed use of portable toilets. In addition, concrete and the water required for concrete mixing likely would be procured off site. As a result, it is estimated that construction activities would require only about 50,000 liters (13,200 gallons) of groundwater on an annualized basis (see Table 5–33), mainly to support new construction and additions to existing ANL-W buildings. It is currently anticipated that this water would be derived from the ANL-W groundwater distribution system via a temporary service connection or trucked to the point of use, especially during the early stages of construction. The relatively small volume of groundwater required during the period of construction compared to site availability and historic usage indicates that construction withdrawals should not have an additional impact on regional groundwater levels or availability. As the depth of groundwater is some 195 meters (640 feet), construction dewatering would not be required.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls, countermeasures, and procedures would be employed to minimize the chance for petroleum, oils, lubricants, and other materials used during construction to be released to the surface or subsurface and to ensure that waste materials are properly disposed of. Waste generation and management activities are detailed in Section 5.5.12. In general, no impact on groundwater availability or quality is anticipated.

Operations Impacts—Buildings housing the relocated TA-18 operations at ANL-W under this alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel, as well as for miscellaneous building mechanical uses. It is estimated that about 6.9 million liters (1.8 million gallons) of water would be required annually for facility operations. As this demand would be a small fraction of existing INEEL and ANL-W usage and would not exceed site availability (see Table 5–34), no additional measurable impact on regional groundwater levels or availability would be anticipated.

No sanitary or industrial effluent would be directly discharged to the surface or subsurface. Waste generation and management activities are detailed in Section 5.5.12. Thus, no operational impacts on groundwater quality would be expected.

5.5.7 Ecological Resources

5.5.7.1 Terrestrial Resources

Construction Impacts—Under this alternative, approximately 0.6 hectares (1.5 acres) of land within ANL-W would be disturbed by construction of an addition to FMF, as well as a new GPEB. Since all new construction would take place within previously disturbed areas of ANL-W, no natural habitat would be lost. Further, because wildlife use of the area to be disturbed is limited, direct impacts on wildlife from construction would be minimal. All construction activities would take place within the existing PIDAS; therefore, direct human disturbance to offsite wildlife and wildlife habitat, such as might be caused by the movement of equipment, would not occur. Indirect impacts on wildlife living adjacent to the site would be limited to temporary disturbance from construction noise.

Operations Impacts—Operations of facilities associated with relocated TA-18 operations would not be expected to impact either wildlife or wildlife habitat at ANL-W because relocated TA-18 mission facilities would not produce emissions or effluent at levels that would affect wildlife.

5.5.7.2 Wetlands

Construction and Operations Impacts—There are no wetlands located within or adjacent to those areas of ANL-W that would be disturbed by construction of TA-18 relocation buildings; therefore, this resource would not be affected during either construction or operations. For the same reason, modification of existing buildings at ANL-W also would not have an impact on wetlands.

5.5.7.3 Aquatic Resources

Construction and Operations Impacts—There are no aquatic resources located within or adjacent to those areas of ANL-W that would be disturbed by construction of TA-18 relocation buildings; therefore, this resource would not be affected during either construction or operations. For the same reason, modification of existing buildings at ANL-W required to support TA-18 operations also would not have an impact on aquatic resources.

5.5.7.4 Threatened and Endangered Species

Construction and Operations Impacts—Under the ANL-W Alternative, there would be no impact on threatened or endangered species at ANL-W. All construction would occur on previously disturbed land. Operations would not impact threatened or endangered species because relocated TA-18 operations would not produce emissions or effluent of quality or at levels that would likely affect these species.

5.5.8 Cultural and Paleontological Resources

5.5.8.1 Prehistoric Resources

Construction and Operations Impacts—Although a number of prehistoric finds have been located near ANL-W, the site itself is highly disturbed and is not likely to yield significant archaeological material (see Section 4.5.8.1). Thus, neither construction of new facilities (i.e., an addition to FMF and the GPEB) or renovation of existing buildings (i.e., ZPPR and EBR-II or TREAT) in support of relocated TA-18 missions would be likely to impact prehistoric resources. Nevertheless, prior to construction, a cultural resource survey would be conducted of the areas to be disturbed. If prehistoric resources were discovered during construction, all work potentially affecting the resources would stop. This work stoppage would be followed by investigations by qualified cultural resource specialists, any coordination necessary with the State Historic Preservation Office, and development and implementation of measures to salvage these resources. The relocation of TA-18 operational capabilities and materials would not affect prehistoric resources under this alternative.

5.5.8.2 Historic Resources

Construction and Operations Impacts—A number of historic items (e.g., a belt buckle, broken glass) have been found in the vicinity of ANL-W (see Section 4.5.8.2); however, these were located outside of the PIDAS. None of the buildings within ANL-W have been designated as National Historic Landmarks, although EBR-II has been designated as an American Nuclear Society Historical Landmark (DOE 1997b). Use of this facility would not result in alterations that would detract from its historical importance. The relocation of TA-18 operational capabilities and materials would not affect historic resources under this alternative.

5.5.8.3 Native American Resources

Construction and Operations Impacts—Although prehistoric Native American resources have been found in the vicinity of ANL-W (see Section 4.5.8.1), due to the developed nature of the site, the likelihood of discovering undisturbed material during construction of new facilities is slight. Thus, impacts on Native American resources resulting from the relocation of TA-18 missions at ANL-W would not be expected. As noted in Section 5.5.8.1, preconstruction cultural response surveys would be conducted, and if any Native American resources were located during construction, work would stop while appropriate action was taken. The relocation of TA-18 operational capabilities and materials would not affect Native American resources under this alternative.

5.5.8.4 Paleontological Resources

Construction and Operations Impacts—Paleontological resources have not been found in the immediate vicinity of ANL-W (see Section 4.5.8.4); therefore, it is unlikely that these resources would be present within the site itself. Thus, impacts on paleontological resources during construction and operations of relocated TA-18 operations would not be expected.

5.5.9 Socioeconomics

Construction Impacts—Modifications to existing ANL-W facilities and construction of a new building would require a peak construction employment level of 120 workers. This level of employment would generate about 321 indirect jobs in the region around ANL-W. The potential total employment increase of 441 direct and indirect jobs represents an approximate 0.4 percent increase in the workforce and would occur only over the 24 months of construction. It would have no noticeable impact on the socioeconomic conditions of the region of influence.

Operations Impacts—Relocation of the TA-18 operational capabilities and materials associated with security Category I/II activities to ANL-W could result in the permanent relocation or hiring of approximately 20 new employees and a small reduction in employment levels at LANL. This level of employment would generate about 54 indirect jobs in the region around ANL-W. The potential total employment increase of 74 direct and indirect jobs represents an approximate 0.06 percent increase in the workforce. It would have no noticeable impact on the socioeconomic conditions of the region of influence.

5.5.10 Public and Occupational Health and Safety

The assessments of potential radiological impacts associated with the ANL-W Alternative are presented in this section. No chemical-related health impacts are associated with any of these alternatives because only very small quantities of industrial-type chemicals, such as ethanol, isopropyl alcohol, magnesium oxide, phenylphosphine, and xylene, would be used. As stated in the *LANL SWEIS* (DOE 1999b), the quantities of these chemicals that could be released to the atmosphere during normal operations are minor and would be below the screening levels used to determine the need for additional analysis. There would be no operational increase in the use of these chemicals as a result of the proposed action. No chemicals have been identified that would be a risk to members of the public from construction activities associated with the ANL-W Alternative. Construction workers would be protected from hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. The potential occupational (industrial) impacts on workers during construction and operations were evaluated based on DOE and Bureau of Labor statistic data, and are detailed in Section C.7 of Appendix C. Construction and operations activities under this alternative are expected to result in some injuries but no

fatalities to workers for the duration of the proposed action (i.e., about 3 years of construction and 25 years of operations).

Summaries of radiological impacts from normal operations and postulated accidents are presented below. The methodologies used to determine the impacts on the public and on facility workers are presented in Appendix B. Supplemental information associated with normal operations and postulated accidents is provided in Appendices B and C, respectively.

5.5.10.1 Construction and Normal Operations

Construction Impacts—No radiological risks would be incurred by members of the public from construction activities. Construction workers may be at a small risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as is reasonably achievable.

Operations Impacts—Under this alternative, the only radiological release would be 10 curies per year of argon-41 to the atmosphere from Godiva operations (see Section 5.5.3.2). The associated calculated impacts on the public are presented in **Table 5–37**. The only dose pathway for receptors would be from immersion in the passing plume. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

As shown in the table, the expected annual radiation dose to the maximally exposed offsite individual member of the public would be much smaller than the limit of 10 millirem per year set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a cancer fatality to this individual from annual operations would be approximately 1.1×10^{-10} per year (i.e., about 1 chance in 9 billion per year of a latent cancer fatality). The projected number of fatal cancers to the population within 80 kilometers (50 miles) would be 2.1×10^{-7} per year (i.e., about 1 chance in 4 million per year of a latent cancer fatality).

Table 5–37 Annual Radiological Impacts to the Public from TA-18 Operations at ANL-W

Receptor	*Impact Values*
Population within 80 Kilometers (50 Miles)	
Collective dose (person-rem)	0.00041
Percent of natural background radiation [a]	4.8×10^{-7}
Cancer fatalities [b]	2.1×10^{-7}
Maximally Exposed Offsite Individual	
Dose (millirem)	0.00021
Percent of regulatory dose limit [c]	0.0021
Percent of natural background radiation [a]	5.8×10^{-5}
Cancer fatalities risk [b]	1.1×10^{-10}
Average Individual within 80 Kilometers (50 Miles)	
Dose (millirem)	1.7×10^{-6}
Percent of natural background radiation [a]	4.8×10^{-7}
Cancer fatalities risk [b]	8.6×10^{-13}

[a] The average annual dose from background radiation at ANL-W is 359 millirem (see Section 4.5.11.1); the 239,100 people living within 80 kilometers (50 miles) would receive an annual dose of 85,800 person-rem from the background radiation.

[b] Based on a cancer risk estimate of 0.0005 latent cancer fatalities per person-rem (see Appendix B).

[c] This comparison cannot be made for the population and average individual because there is no standard or limit.

Direct radiation doses to the public from operations of the relocated TA-18 critical assembly machines would be limited based on protective and administrative design features of the new relocated facilities. The dose to any member of the public from direct radiation during critical assembly machine operations at the relocated facilities would essentially be zero.

Annual radiological doses to the 100 workers involved with operations of the relocated TA-18 mission facilities under this alternative would average 100 millirem per worker, for a total workforce annual dose of 10 person-rem. The annual doses to individual workers would be well below the DOE limit of 5,000 millirem (10 CFR 835); the DOE Control Level of 1,000 millirem per year, as established in 10 CFR 835.1002; and the recommended Administrative Control Level of 500 millirem (DOE 1999c). An individual worker's annual risk of a fatal cancer is projected to be 4.0×10^{-5} (i.e., about 1 chance in 25,000 per year of a latent cancer fatality), and the projected number of fatal cancers in the workforce from operations would be 0.0040 per year (or 1 chance in 250 that the worker population would experience a fatal cancer per year of operations).

5.5.10.2 Facility Accidents

Under the ANL-W Alternative, the TA-18 operational capabilities and materials would be relocated to existing ANL-W buildings. The ANL-W buildings would be upgraded and modified as required to provide safety features that would reduce the risks of accidents that currently exist at LANL under the No Action Alternative. The accident scenarios described for the No Action Alternative at LANL are considered applicable to the ANL-W buildings, with one exception. Accidents associated with SHEBA are excluded because the SHEBA missions would be moved to LANL's TA-39; its impacts are shown in Section 5.6.3.10. Certain scenario parameter values applicable to the No Action Alternative, such as leak path factors, materials at risk, and the corresponding source term, have been adjusted to reflect improved safety features of the ANL-W buildings.

Radiological Impacts—**Table 5–38** shows the frequencies and consequences of the postulated set of accidents for a noninvolved worker and the public (maximally exposed individual and the general population living within 80 kilometers [50 miles] of the facility). **Table 5–39** shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident could occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *TA-18 BIO* (DOE 2001a). The selection process and screening criteria used (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents at TA-18 facilities. Thus, in the event that any other accident not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Consideration has also been given to the possibility of an accident originating with the collocated ANL-W operations that could initiate an accident at the facilities of the relocated TA-18 operations. Because of the robust design of the ANL-W facilities that would be used for TA-18 operations and the distance to any nearby facilities, it was determined that there were no reasonably foreseeable collocated accidents.

The accident with the highest risk to the offsite population (see Table 5–39) would be a high-pressure spray fire on a Comet machine with a plutonium core accident. The increased number of latent cancer fatalities in the offsite population would be 7.7×10^{-9} per year (i.e., about 1 chance in 130 million per year of a latent cancer fatality). The highest risk of a latent cancer fatality to the maximally exposed offsite individual would be 7.3×10^{-12} per year (i.e., about 1 chance in 137 billion per year of a latent cancer fatality). The highest risk of a latent cancer fatality to a noninvolved worker located at a distance of 100 meters (109 yards) from the accident would be 7.2×10^{-9} per year (i.e., about 1 chance in 140 million per year of a latent cancer fatality).

Table 5–38 Accident Frequency and Consequences under the ANL-W Alternative

		Maximally Exposed Offsite Individual		*Offsite Population* [a]		*Noninvolved Worker*	
	Frequency (per year)	*Dose (rem)*	*Latent Cancer Fatalities* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatalities* [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core accident							
	1.0×10^{-6}	0.00021	1.1×10^{-7}	0.162	8.1×10^{-5}	1.15	0.00046
Bare, fully reflected or moderated metal criticality accident							
	1.0×10^{-4}	8.3×10^{-12}	4.2×10^{-15}	3.1×10^{-9}	1.6×10^{-12}	2.0×10^{-8}	8.0×10^{-12}
High-pressure spray fire on a Comet machine with a plutonium core accident							
	1.0×10^{-6}	0.015	7.3×10^{-6}	15.4	0.0077	17.9	0.0072
Earthquake-induced facility failures without fire accident							
	1.0×10^{-4}	8.9×10^{-6}	4.4×10^{-9}	0.0090	4.5×10^{-6}	0.049	1.9×10^{-5}

[a] Based on a population of 239,099 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table 5–39 Annual Cancer Risks Due to Accidents under the ANL-W Alternative

Accident	*Maximally Exposed Offsite Individual* [a]	*Offsite Population* [b, c]	*Noninvolved Worker* [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	1.1×10^{-13}	8.1×10^{-11}	4.6×10^{-10}
Bare, fully reflected or moderated metal criticality	4.2×10^{-19}	1.6×10^{-16}	8.0×10^{-16}
High-pressure spray fire on a Comet machine with a plutonium core	7.3×10^{-12}	7.7×10^{-9}	7.2×10^{-9}
Earthquake-induced facility failures without fire	4.4×10^{-13}	4.5×10^{-10}	1.9×10^{-9}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 239,099 persons residing within 80 kilometers (50 miles) of the site.

Hazardous Chemicals and Explosives Impacts—There would be no hazardous chemicals or explosives used or stored at the new or modified ANL-W buildings, other than minor industrial quantities, that would impact workers or the public under accident conditions.

Involved Worker Impacts

Approximately 100 workers would be located at the ANL-W facility. During criticality experiments, workers would be safely located beyond a prescribed distance from the experiments.

Workers in the vicinity of an accident could be at risk of serious injury or fatality. The uncontrolled reactivity insertion on the Comet or Planet assemblies with a plutonium core would be typical of worker impacts during accident conditions.

Facility operating procedures prohibit personnel from being in the test facility during remote operation of the Comet or Planet assemblies. If an accident were to occur during a test run due to improper experiment setup and/or a combination of operator errors from the control room, the involved workers would be in the remote-control room and no workers would be present in the test facility. Workers in the remote-control room would be protected by a combination of shielding and distance from the immediate impacts of the accident. The remote-control room engineered safety features and/or protective actions taken by the control-room staff to limit contamination of the control-room environment would protect the involved workers.

In the event that workers in the bay area setting up the test initiate a criticality accident, it is anticipated these workers would be subject to serious injury or fatality as a result of the accident. Since the facility operating procedures would not prohibit workers from being in adjacent areas during operations, it is anticipated that workers in the vicinity outside of the bay would receive an estimated dose of less than 200 millirem after an uncontrolled criticality event. (This is estimated based on the potential energy released during this accident in relation to that used to design the shielding requirements.)

Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional risk of radiological injury.

5.5.11 Environmental Justice

Construction Impacts—There would be no disproportionately high and adverse environmental impacts on minority and low-income populations due to construction under the ANL-W Alternative. As stated in other subsections of Section 5.5, environmental impacts from construction would be small and would not be expected to extend beyond the ANL-W site boundary.

Operational Impacts—No disproportionately high and adverse environmental impacts on minority and low-income populations would occur under the ANL-W Alternative. This conclusion is a result of analyses presented in this EIS that determined there were no significant impacts on human health, ecological, cultural, paleontological, socioeconomic, and other resource areas described in other subsections of Section 5.5.

During normal operations, approximately 10 curies of the noble gas argon-41 could be activated in the atmosphere. The impacts measured in terms of latent cancer fatalities on the general population would be small, as indicated in Table 5–37. Additionally, subsistence consumption of crops and wildlife radiologically contaminated with argon-41 would not be harmful since argon-41 has a half-life of 1 hour and 48 minutes and decays into a stable isotope of potassium that is not harmful to human health in small quantities.

Columns 2 and 3 of Table 5–39 show the radiological risks to the maximally exposed offsite individual and offsite population, respectively, that could result from postulated accidents under the ANL-W Alternative. All of these risks are essentially 0. Hence, none of the postulated accidents would pose a significant radiological risk to the public, including minority and low-income individuals and groups within the population at risk.

5.5.12 Waste Management

In accordance with the Records of Decision for the *Waste Management PEIS* (DOE 1997a), waste could be treated and disposed of on site at ANL-W or at other DOE sites or commercial facilities. Based on the Record of Decision for hazardous waste published on August 5, 1998 (63 FR 41810), nonwastewater hazardous waste will continue to be treated and disposed of at offsite commercial facilities. Based on the Record of Decision for low-level radioactive and mixed low-level radioactive waste published on February 18, 2000 (65 FR 10061), minimal treatment of low-level radioactive waste will be performed at all sites, and, to the extent practicable, onsite disposal of low-level radioactive waste will continue. Hanford and NTS will be made available to all DOE sites for disposal of low-level radioactive waste. Mixed low-level radioactive waste analyzed in the *Waste Management PEIS* will be treated at Hanford, INEEL, the Oak Ridge Reservation, and the Savannah River Site and will be disposed of at Hanford and NTS.

It is assumed in this EIS that low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous waste would be treated, stored, and disposed of in accordance with current and developing site practices. No high-level radioactive or transuranic waste is generated from TA-18 operations.

Construction Impacts—No radioactive or hazardous waste types are expected to be generated from the modification to the existing ANL-W buildings to relocate the TA-18 operations at ANL-W. The impacts on the ANL-W waste management systems, in terms of managing the waste, are discussed in this section. Radiological and chemical impacts on workers and the public from waste management activities are included in the public and occupational health and safety impacts provided in Section 5.5.10.

A minimum amount of concrete and rebar would be demolished from the existing facilities for the connection of the new facility additions. These materials would be buried in the new bermed areas for the new additions. Any waste generated from the construction activities would not be part of the ANL-W waste stream and would be the responsibility of the construction contractor (ANL-W 2001).

Sanitary wastewater generated during construction activities would be managed using portable toilet systems.

Operations Impacts—The expected generation rates of waste at ANL-W associated with the relocation of the TA-18 operational capabilities and materials to a new location at ANL-W are compared with ANL-W's treatment, storage, and disposal capacities as shown in **Table 5–40**. The impacts on the ANL-W waste management systems, in terms of managing the waste, are discussed in this section. Radiological and chemical impacts on workers and the public from waste management activities are included in the public and occupational health and safety impacts provided in Section 5.5.10.

Table 5–40 Operations Waste Management Impacts under the ANL-W Alternative

Waste Type [a]	*Estimated Waste Generation for TA-18 Mission Operations (cubic meters per year)*	*Estimated Waste Generation as a Percent of* [b]		
		Onsite Treatment Capacity	*Onsite Storage Capacity*	*Onsite Disposal Capacity*
Low-level radioactive waste				
Liquids	0	0	0	0
Solids	145	Not applicable	Not applicable	0.38
Mixed low-level radioactive waste				
Liquids	0	0	0	0
Solids	1.5	0.02	0.02	Not applicable
Hazardous waste				
Liquids	0	0	0	0
Solids	4 4,000 (kilograms per year)	Not applicable	0.04	Not applicable
Nonhazardous waste				
Sanitary wastewater	6,900 [c]	(d)	Not applicable	(d)
Solids	0	0	0	0

[a] See definitions in Chapter 8.

[b] The estimated amounts of waste generated annually are compared with the annual site treatment capacities. The estimated total amounts of waste generated over the assumed 25-year operating period are compared with the site storage and disposal capacities.

[c] Based on the assumption of 100 workers generating 50 gallons per day.

[d] This sanitary wastewater would be discharged to the Sanitary Sewage Lagoons at ANL-W.

Not applicable (i.e., the majority of this waste is not routinely treated, stored, or disposed of on site, or is not held in long-term storage).

Solid low-level radioactive waste generated from TA-18 operations conducted at the new location at ANL-W would be treated, as necessary, by compaction, size reduction, or stabilization prior to being sent for disposal at the Radioactive Waste Management Complex. The annual amount of solid low-level radioactive waste i.e., 145 cubic meters (190 cubic yards) is estimated as 0.38 percent of the 37,700-cubic-meter-per-year (49,000-cubic-yard-per-year) disposal capacity of the Radioactive Waste Management Complex. Approximately 3,600 cubic meters (4,700 cubic yards) of low-level radioactive waste would be generated

from these operations activities over the 25-year operating period. At some future time, low-level radioactive waste would be disposed of off site. The impacts of managing this waste at ANL-W would be minimal.

Mixed low-level radioactive waste generated from TA-18 operations conducted at a new location at ANL-W would be stabilized, packaged, and stored on site for treatment and disposal in a manner consistent with the site treatment plan. Mixed low-level radioactive waste is currently treated on site with some waste shipped to Envirocare of Utah for disposal. The 1.5-cubic-meter (2-cubic-yard) annual estimate of mixed low-level radioactive waste generation represents about 0.02 percent of the 6,500-cubic-meter-per-year (8,500-cubic-yard-per-year) planned capacity of the Advance Mixed Waste Treatment Facility. A total of about 38 cubic meters (50 cubic yards) of mixed low-level radioactive waste would be generated over the 25-year operating period of conducting TA-18 mission activities at ANL-W. This waste represents about 0.02 percent of the 177,300-cubic-meter (231,900-cubic-yard) storage capacity of the Radioactive Waste Management Complex. The impacts of managing this waste at ANL-W would be minimal.

Hazardous waste generated from TA-18 operations conducted at a new location at ANL-W would be packaged in U.S. Department of Transportation-approved containers and shipped off site to permitted commercial recycling, treatment, and disposal facilities. This waste is not typically stored in long-term storage (i.e., more than one year). Approximately 4 cubic meters (5 cubic yards) per year of hazardous waste would be generated. This waste represents about 0.04 percent of the 9,600-cubic-meter (13,000-cubic-yard) capacity of the hazardous waste storage building (including staging). The impacts of managing this waste at ANL-W would be minimal.

Approximately 6,900 cubic meters (9,000 cubic yards) per year of sanitary wastewater would be generated from the relocation of TA-18 operational capabilities and materials to ANL-W. This sanitary wastewater would be discharged to the Sanitary Sewage Lagoons at ANL-W. The impacts of managing this waste at ANL-W would be minimal.

5.5.13 Transportation Impacts

The transportation analysis was carried out as described in Appendix D. Under the ANL-W Alternative, approximately 92 shipments of radioactive materials from TA-18 would be relocated to ANL-W. The total distance traveled on public roads by truck carrying radioactive materials would be 345,000 kilometers (215,000 miles).

Incident-Free Transportation Impacts—The dose to transportation workers from all transportation activities under this alternative was calculated at 0.28 person-rem; the dose to site workers involved in packaging and loading at TA-18 and unloading and unpacking at ANL-W was calculated at 2.3 person-rem; and the dose to the public was calculated at 0.39 person-rem. Accordingly, incident-free transportation of radioactive material would result in 0.00011 latent cancer fatalities among transportation workers; 0.0009 latent cancer fatalities among site workers; and 0.00019 latent cancer fatalities in the total affected population over the duration of the transportation activities. The number of nonradiological fatalities from vehicular emissions associated with this alternative was calculated to be 0.00062.

Transportation Accident Impacts—Estimates of total transportation accident risks under the ANL-W Alternative are as follows: a collective dose to the affected population of 0.000038 person-rem, resulting in 1.9×10^{-8} latent cancer fatalities; a traffic accident, resulting in 0.00023 traffic fatalities; and a dose of 139 rem to a hypothetical maximally exposed individual located 33 meters (108 feet) directly downwind from a most severe accident (Severity Category 8) with a release frequency of 6×10^{-7} per year, leading to a risk of 0.07 of developing a latent cancer fatality.

5.5.14 Cumulative Impacts

The projected incremental environmental impacts of implementing the proposed action at ANL-W were added to the environmental impacts of other present and reasonably foreseeable future actions at or near ANL-W to obtain cumulative site impacts under normal operations. Other ongoing actions have been included in the baseline impacts presented in Chapter 4. Potential cumulative impacts from other reasonably foreseeable future actions include those presented in the *Idaho National Engineering and Environmental Laboratory Advanced Mixed Waste Treatment Project Final Environmental Impact Statement* (DOE 1999a); the *Draft Idaho High-Level Waste and Facilities Disposition Environmental Impact Statement* (DOE 1999h); the *Final Environmental Impact Statement for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel* (DOE 2000d); and the *Nuclear Infrastructure Programmatic EIS* (DOE 2000j). Additional NEPA documents related to ANL-W and INEEL that are considered in the cumulative impacts analysis include:

The *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE 1995c). This programmatic EIS is a complex-wide evaluation of the alternatives for managing the existing and projected amounts of spent nuclear fuel within the DOE inventory through 2035. The EIS contains an analysis of the impacts of transporting spent nuclear fuel, as well as sitewide alternatives for environmental restoration and waste management programs at INEEL. In the associated Record of Decision, DOE designated Hanford, INEEL, and the Savannah River Site for regional spent fuel storage and management and made decisions about environmental restoration and waste management activities at INEEL. In March 1996, DOE issued an amendment to the May 1995 Record of Decision to include a decision to regionalize the management of DOE-owned spent nuclear fuel by fuel type, including spent fuel currently stored at Hanford, INEEL, and the Savannah River Site.

The *Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (DOE 1996a). This EIS evaluates the adoption of a joint DOE/U.S. Department of State policy to manage spent nuclear fuel from foreign research reactors, including highly enriched uranium provided by the United States to other countries for research reactors. Management alternatives include a number of implementation options for port selection, transportation, and storage at DOE sites. In the Record of Decision, DOE selected a management policy that returned spent nuclear fuel from various foreign research reactors to the United States using two designated U.S. ports and management at INEEL and the Savannah River Site.

Cumulative transportation impacts were determined by analyzing the impacts along the various routes used to transport the materials associated with relocated TA-18 activities over the 25-year operating period. The methodology for assessing cumulative impacts is presented in Appendix F.

In this section, cumulative site impacts are presented only for those "resources" at a site that may reasonably be expected to be affected by the proposed action. These include site employment, electrical consumption, water usage, air quality, waste management, and public and occupational health and safety. This section also includes the cumulative impacts associated with intersite transportation.

Resource Requirement Impacts—Cumulative impacts on key resource requirements at ANL-W are presented in **Table 5–41**. As a whole, use of all major resources would remain within the INEEL site capacity. The proposed relocation of TA-18 missions at ANL-W would require a small increase in the site's use of electricity and water of approximately 0.6 percent and 0.02 percent, respectively. Cumulatively, INEEL would use about 78 percent of the available electrical capacity and about 13 percent of the available water capacity. Site employment could increase by approximately 20 workers.

Table 5–41 Maximum Cumulative Resource Use and Impacts at ANL-W and INEEL

Activities	*Site Employment*	*Electrical Consumption (megawatt-hours per year)*	*Water Usage (million liters per year)*
Existing site activities [a]	7,993	221,772	4,829
SNF Management and INEL Environmental Restoration and Waste Management	–	2,200	2
Foreign Research Reactor SNF Management	–	1,000	2
Waste Management PEIS	–	13,980	194
Advanced Mixed Waste Treatment Project	–	33,000	16
High-Level Radioactive Waste and Facilities Disposition	–	33,000	351
Nuclear Infrastructure Operations	24	Negligible [b]	1.68
New TA-18 Operations	20	2,249	6.9
Total	8,037	307,201	5,403
Total site capacity	Not applicable	394,200	43,000

SNF = spent nuclear fuel, INEL = Idaho National Engineering Laboratory, PEIS = programmatic environmental impact statement.

[a] Reflects current sitewide activities (except that the "Site Employment" value also reflects projected employment from other activities) anticipated to continue during all or part of the 25-year period evaluated for proposed TA-18 operations.

[b] Additional electricity consumption associated with this option would be negligible compared to that associated with existing facility activities.

Note: To convert from liters per year to gallons per year, multiply by 0.264; to convert from megawatt-hours to British thermal units, multiply by 3.42×10^6.

Air Quality Impacts—Cumulative impacts on air quality at ANL-W are presented in **Table 5–42**. ANL-W is currently in compliance with all Federal and state ambient air quality standards and would continue to remain in compliance, even after including the cumulative effects of all activities. The contributions of TA-18 operations to overall site concentrations are expected to be very small.

Public and Occupational Health and Safety – Normal Operations Impacts—Cumulative impacts in terms of radiation exposure to the public and workers at ANL-W are presented in **Table 5–43**. There would be no increase expected in the number of latent cancer fatalities in the population from site operations if TA-18 operations were to occur at ANL-W. The dose limits for individual members of the public are given in DOE Order 5400.5. As discussed in that order, the dose limit from airborne emissions is 10 millirem per year, as required by the Clean Air Act; the dose limit from drinking water is 4 millirem per year, as required by the Safe Drinking Water Act; and the dose limit from all pathways combined is 100 millirem per year. Therefore, as is evident in Table 5–43, the dose to the maximally exposed offsite individual would be expected to remain well within regulatory limits. Onsite workers would be expected to see an increase of approximately 0.004 latent cancer fatalities due to radiation from TA-18 operations over the 25-year operating period.

Table 5–42 Maximum Cumulative Air Pollutant Concentrations at ANL-W for Comparison with Ambient Air Quality Standards

Parameter	*Carbon Monoxide*		*Nitrogen Dioxide*	*PM_{10}*		*Sulfur Dioxide*		
Averaging Period	*8 Hours*	*1 Hour*	*Annual*	*Annual*	*24 Hours*	*Annual*	*24 Hours*	*3 Hours*
Activities								
Existing ANL-W site activities [a] (micrograms per cubic meter)	13	57	1.1	0.018	0.28	0.88	11	62
Additional INEEL contribution [b] (micrograms per cubic meter)	78	206	0.46	0.49	12	0.14	5.3	24
Advanced Mixed Waste Treatment Project [c] (micrograms per cubic meter)	0.85	115	0.34	0.006	4.6	0.012	4.5	25
Sodium-Bonded Spent Nuclear Fuel Project (micrograms per cubic meter)	0	0	0	0	0	0	0	0
HLW & FD [d] (micrograms per cubic meter)	4.2	10	0.19	0.02	0.28	0.57	8.9	42
Nuclear infrastructure operations (micrograms per cubic meter)	0	0	0	0	0	0	0	0
New TA-18 operations	5.27	22	0.002	less than 0.001	0.578	less than 0.001	0.539	3.49
Total concentration (micrograms per cubic meter)	101	410	2.1	0.54	18	1.6	30	156
Standard								
Most stringent standard [e] (micrograms per cubic meter)	10,000	40,000	100	50	150	80	365	1,300

HLW & FD = high-level radioactive waste and facilities disposition.

[a] The contribution from existing ANL-W sources evaluated in the *Final EIS for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel*, Table 3–2 (DOE 2000d, but reanalyzed using the ISCST3 model).

[b] Environmental impacts associated with existing site activities (excluding activities at ANL-W) as shown in the *Idaho High-Level Waste and Facilities Disposition Draft EIS*, Table C.2-14 (DOE 1999h) and in the *Final EIS for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel*, Table 3–2 (DOE 2000d). The activities whose concentrations are provided in this row are anticipated to continue during part or all of the 25-year period evaluated for proposed TA-18 operations.

[c] *Advanced Mixed Waste Treatment Project Final EIS* activities—proposed action with microencapsulation or vitrification, Table 5.7-6 (DOE 1999a).

[d] *Idaho High-Level Waste and Facilities Disposition Draft EIS* site boundary contribution for planning basis option, Table C.2-14 (DOE 1999h).

[e] The more stringent of the Federal and state standards is presented if both exist for the averaging period.

Table 5–43 Maximum Cumulative Radiation Impacts at ANL-W

Impact	Maximally Exposed Offsite Individual		Population Dose within 80 Kilometers (50 Miles)		Total Site Workforce	
	Annual Dose (millirem per year)	Risk of a Latent Cancer Fatality [a]	Dose (person-rem)	Number of Latent Cancer Fatalities [a]	Dose (person-rem per year)	Number of Latent Cancer Fatalities [a]
Existing site activities [b]	0.008	1.0×10^{-7}	0.075	9.4×10^{-4}	64.9	0.026
Storage and disposition	1.6×10^{-6}	2.0×10^{-11}	1.8×10^{-5}	2.3×10^{-6}	25	0.010
Foreign research reactor spent nuclear fuel	5.6×10^{-4}	7.0×10^{-9}	0.0045	5.6×10^{-5}	33	0.013
Spent nuclear fuel	0.008	1.0×10^{-7}	0.19	2.4×10^{-3}	5.4	0.0022
Advanced Mixed Waste Treatment Project	0.022	2.8×10^{-7}	0.009	1.1×10^{-4}	4.1	0.0016
High-level radioactive waste and facilities disposition [c]	0.002	2.5×10^{-8}	0.10	0.0013	59	0.023
Sodium-bonded spent nuclear fuel	0.002	2.5×10^{-8}	0.012	1.5×10^{-4}	22	0.0088
Nuclear infrastructure operations at the Advanced Test Reactor	0	0	0	0	0	0
New TA-18 operations	2.1×10^{-4}	2.8×10^{-9}	0.00041	5.1×10^{-6}	10	0.004
Total	0.043 [d]	5.3×10^{-7} [d]	0.39	0.0049	223	0.089

[a] These values are calculated based on a 25-year exposure period.

[b] Environmental impacts associated with present activities at ANL-W anticipated to continue during all or part of the 25-year period evaluated for proposed relocated TA-18 operations.

[c] DOE 2000d; Table 4-66.

[d] The same individual would not be expected to be the maximally exposed individual for all activities at ANL-W. The location of the maximally exposed individual depends upon where on the site an activity is performed. However, to provide an upper bound of the cumulative impacts to the maximally exposed individual, the impacts from each activity have been summed.

Source: DOE 2000j.

Waste Management

Cumulative amounts of waste generated at ANL-W are presented in **Table 5–44**. It is unlikely that there would be major impacts on waste management at ANL-W because sufficient capacity would exist to manage the site waste. None of the alternatives assessed in this *TA-18 Relocation EIS* would generate more than a small amount of additional waste at ANL-W.

Transportation Impacts—The cumulative impacts from transportation associated with the relocation of TA-18 missions are identified in Appendix D. Because likely transportation routes cross many states, cumulative impacts are compared on a national basis. Under the ANL-W Alternative assessed in this *TA-18 Relocation EIS*, occupational radiation exposure to transportation workers and exposure to the public are estimated to represent less than 0.01 percent of the cumulative exposures from nationwide transportation (DOE 2002). No additional traffic fatality is expected; the incremental increase in traffic fatalities would be less than 0.0001 percent per year.

Table 5–44 Cumulative Impacts on Waste Management Activities from ANL-W and INEEL Concurrent Activities (cubic meters)

Waste Type	*Existing Site Activities* [a]	*Idaho HLW and Facility Disposition EIS* [b]	*Treatment and Management of Sodium-Bonded SNF* [c]	*Nuclear Infra-structure Operations* [d]	*TA-18 Re-location EIS* [e]	*Total*	*Site Capacity* [f]		
							Treatment (cubic meters per year)	*Storage (cubic meters)*	*Disposal (cubic meters per year)*
Low-level radioactive	135,600	15,320	862	35	3,625	155,447	42,363	177,493	69,530
Mixed low-level radioactive	3,767	12,837	40	0	38	16,682	157,092	187,761	NA
Hazardous	1,180	2,457	0	0	100	3,737	NA	9,619	NA
Non-hazardous	124,905	145,262	4,960	0	365,000	640,127	3,200,000	NA	3,062,000

HLW = High-Level Radioactive Waste; SNF = Spent Nuclear Fuel; NA = not applicable (i.e., the majority of the waste is not routinely treated, stored, or disposed of on site).

[a] DOE 2000d: Table 4–67, and Figures 5.4-1 through 5.4-3 and input values for those figures representing the 25-year operating period (DOE 1999h).

[b] DOE 2000d: Table 4–67, and Separations Alternative – Maximum quantities for any alternative (DOE 1999h).

[c] DOE 2000d: Table 4–18, Alternative 1, Electrometallurgically Treat Blanket and Driver Fuel at ANL-W; 12 years of operations and selected in the Record of Decision (65 FR 56565).

[d] DOE 2000j: 4-122, Alternative 2, Option 7, Use Only Existing Operational Facilities and selected in the Record of Decision (66 FR 7877).

[e] ANL-W Alternative.

[f] Capacities derived from Table 4–68, *TA-18 Relocation EIS*.

Sources: DOE 2000d; Sections 4.5.12 and 5.5.12, *TA-18 Relocation EIS*.

5.6 RELOCATION OF SHEBA AND OTHER SECURITY CATEGORY III/IV ACTIVITIES

SHEBA and other security Category III/IV activities of TA-18 would either be relocated to TA-39 and TA-55, respectively, or remain at TA-18. The locations of TA-39 and TA-55 within LANL are shown in Figure 4–2.

The following sections present a separate complete analysis for the relocation of SHEBA activities to TA-39 and other security Category III/IV activities to TA-55. This analysis includes a discussion on the selection of TA-39 as the proposed site for the relocation of SHEBA. Because TA-55 was chosen for the relocation of security Category III/IV activities to coincide with the relocation of security Category I/II activities, a site selection process was not required. This section also includes a description of facility requirements, operational characteristics, and construction requirements for SHEBA and security Category III/IV activities. The analysis includes a description of the unique affected environment features of TA-39, the portion of TA-55 identified for the security Category III/IV relocation activities (the affected environment of LANL as a whole, TA-18, and the rest of TA-55 are described in Chapter 4), and the environmental impacts resulting from the proposed relocation of SHEBA and other security Category III/IV activities.

5.6.1 Basis for Analysis

The following sections present a discussion on the selection of TA-39 as the proposed site for the relocation of SHEBA. Facility requirements, operational characteristics, and construction requirements for SHEBA and security Category III/IV activities are also presented.

5.6.1.1 Siting Selection for SHEBA

SHEBA and other security Category III/IV activities are currently conducted at TA-18. A major distinguishing characteristic of the SHEBA criticality machine is that it is used to test and calibrate criticality alarm detectors and personal dosimeters. This use requires that the SHEBA machine is operated in a "free-field" environment, i.e., with no radiation shielding. Because TA-18 is very close to the heavily traveled Pajarito Road, many SHEBA operations must be performed at nighttime and require Pajarito Road to be closed. Leaving SHEBA at its current location would offer little advantage, especially if security Category I/II activities were relocated, as the ongoing cost of maintaining an aging infrastructure could exceed the capital costs for new facilities.

To minimize the potential exposure to members of the public and collocated uninvolved workers, some SHEBA operations require Pajarito Road to be closed and a minimal site occupancy at TA-18. A new site that limits public access would allow experiments to be conducted during normal working hours. Maintaining a distance to the public of 800 to 1,000 meters (875 to 1,094 yards) is desirable to limit the requirement for safety-class structures, systems, and components. SHEBA operations require the ability to be controlled remotely, thereby necessitating a control building from which to operate the SHEBA assembly. On the other hand, the operations require simple structures with the usual utilities, such as electricity, water, sewer, and compressed air.

The initial set of technical area criteria for siting SHEBA included relatively low population densities and some utilities. TA-39 was identified as the site for the relocation of SHEBA activities because of its remote location and the availability of existing facilities and utilities that would reduce construction costs. While once used extensively for explosives testing, most of this activity at TA-39 has been transferred to other locations at LANL. Therefore, relocating SHEBA activities to TA-39 would require only a moderate amount of coordination with other existing site activities. A brief discussion of other sites at LANL evaluated for the relocation of SHEBA activities and the reasons they were not considered for detailed analysis follows (their locations at LANL are shown in Figure 4–2):

TA-16—The main deficiency of the TA-16 site is that substantial development of this general area ("Experimental Engineering") is planned. The *LANL Comprehensive Site Plan 2000* (LANL 2000g) specifies that this area is scheduled to contain tritium facilities, explosives facilities, and facilities related to the Advanced Hydrotest Facility. Locating SHEBA in this area would hinder these developments as well as SHEBA's operational efficiency.

TA-49—Proximity to the public is the main deficiency of this site. State Highway 4 is only 500 meters (547 yards) away from this site, and LANL has no control over this state highway.

TA-36—Current and planned use of this area for high-explosives testing is the main deficiency of this site. The high frequency of planned explosives testing would severely impact SHEBA's operational efficiency.

TA-33—This site has several significant deficiencies. The utilities in this area are very limited, the site is close to a popular trail leading to the Rio Grande Valley, and, on several occasions, hikers have walked up into the area.

5.6.1.2 Facilities

The relocation of the SHEBA activities to TA-39 would involve the construction of a new structure on top of an existing bunker (Building 6 at TA-39) or the construction of a new bunker and cover structure at another suitable location at TA-39. The bunker, in both cases, would be used to house the SHEBA solution tanks and support equipment. A new control and training-room structure would either be built along the existing road leading to Building 6 at TA-39 or in relatively close proximity to the construction of the new SHEBA bunker. In either case, it would be outside the SHEBA radiation and existing explosives magazines exclusion zones. Water and gas would be extended to this building, along with the installation of a septic tank and leach field. The location of the existing Building 6 at TA-39 proposed for the relocation of SHEBA is shown in **Figure 5–1**.

The relocation of the security Category III/IV activities to LANL's TA-55 would involve the construction of a new laboratory and a new office building at TA-55 in the proximity of the proposed new underground facility for security Category I/II activities, but outside the PIDAS. The location of these two buildings for the relocation of security Category III/IV activities at LANL's TA-55 is shown in **Figure 5–2**. If a decision is made that security Category III/IV activities remain at TA-18, some internal modifications to TA-18 facilities would be required, but no new construction. Internal modifications would be limited to rearrangement of internal spaces to accommodate the security Category III/IV activities.

5.6.1.3 Operational Characteristics

The operational characteristics of the facilities at TA-18 are provided in Section 3.2.1 and Table 3–2. They include all security Categories (i.e., security Category I/II, SHEBA, and other security Category III/IV activities). The operational characteristics for only SHEBA or security Category III/IV activities cannot be easily separated. Therefore, with the exception of the potential radiological effluent (100 curies per year of argon-41 from SHEBA activities), all other operational characteristics are assumed to be those in Table 3–2.

5.6.1.4 Construction Requirements

Table 5–45 shows the construction requirement parameters used for the environmental impact analysis.

Table 5–45 Construction Requirements to Relocate SHEBA and Security Category III/IV Activities to TA-39 and TA-55, Respectively

Requirement	*SHEBA*		*New Office and Laboratory Building for Security Category III/IV Activities*
	Existing Bunker	*New Bunker and Cover Structure*	
Electrical energy (megawatt-hours)	5.2	5.2	26
Peak electric demand (megawatts)	0.013	0.013	26
Concrete (cubic meters)	40	200	971
Steel (metric tons)	11.2	18.6	302
Fuel/gasoline (liters)	(a)	(a)	(a)
Water (liters)	34,100	34,100	4,660,000
Land (hectares)	0.2	0.2	1.7
Construction Workers			
Peak (workers)	25	25	45
Construction time (months)	6	8	12 to 18

[a] Not provided. Considered to be part of construction cost; contractors are to provide fuel/gasoline needed for their machinery.
Source: LANL 2001a.

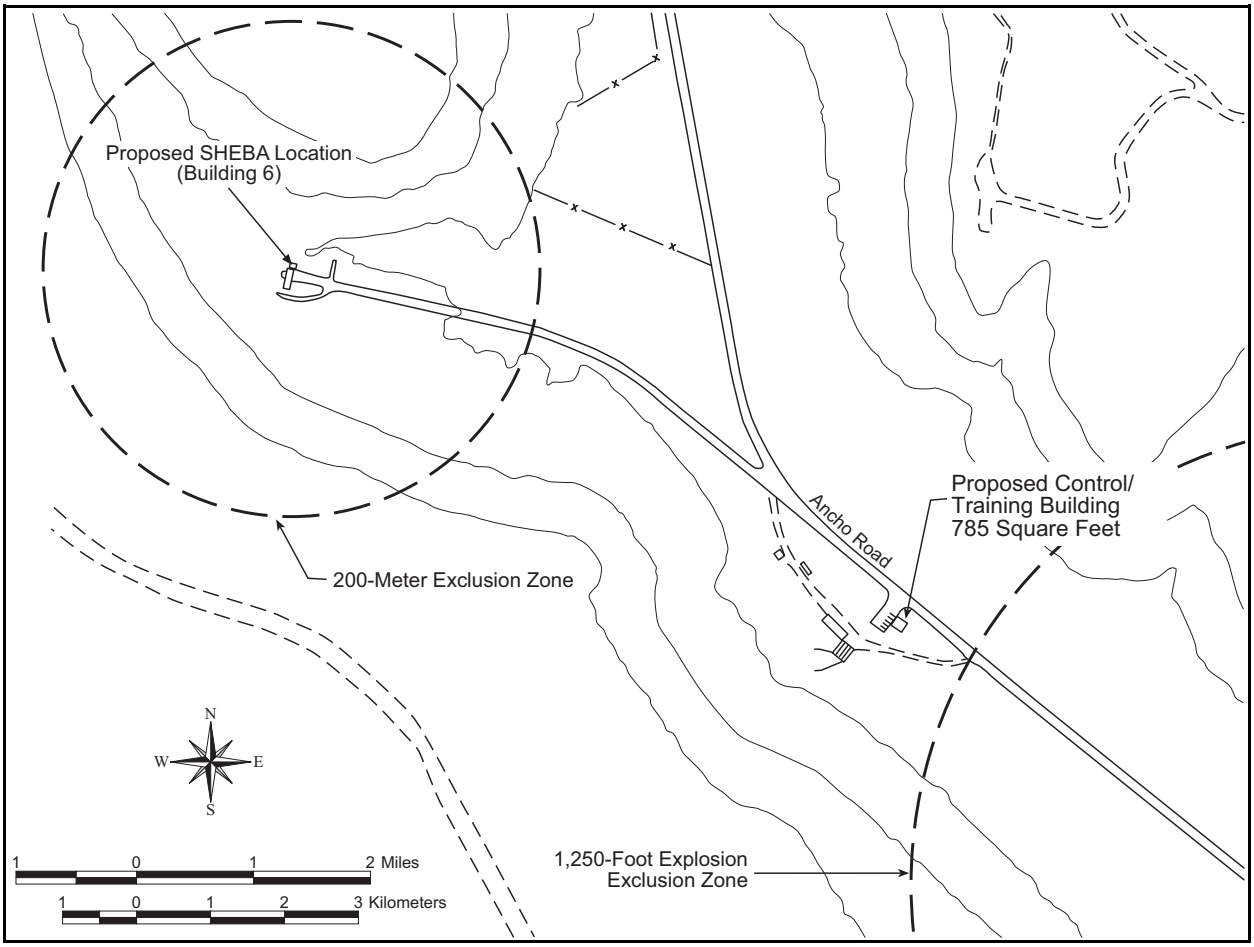

Figure 5–1 Location of the Proposed Facilities for the Relocation of SHEBA at LANL's TA-39

5.6.2 Affected Environment

SHEBA and other security Category III/IV activities would either remain at TA-18 or be relocated to LANL's TA-39 and TA-55, respectively. The affected environment for the relocation of SHEBA and other security Category III/IV activities, therefore, is associated in general with LANL and specifically with TA-18, TA-39, and TA-55.

The affected environment at LANL, including unique features at TA-18 and the part of TA-55 selected for the proposed relocation of security Category I/II activities, was described previously in Chapter 4. Some of the features unique to LANL's TA-39 affected environment and the part of TA-55 selected for the proposed relocation of TA-18 security Category III/IV activities are described below. The following descriptions of the affected environment at LANL's TA-39 and TA-55 are based all or in part on information provided in the *LANL SWEIS* (DOE 1999b).

Land Resources

Land Use—TA-39 is located within the Explosives/Waste Disposal land-use category (see Figure 4–3). It is located in the southeastern part of LANL. TA-39 borders Bandelier National Monument and is about 3.2 kilometers (2 miles) southeast of White Rock, a residential community. The site is used for studying high-energy density properties in experiments using explosives-driven pulsed power. Typically, open-air

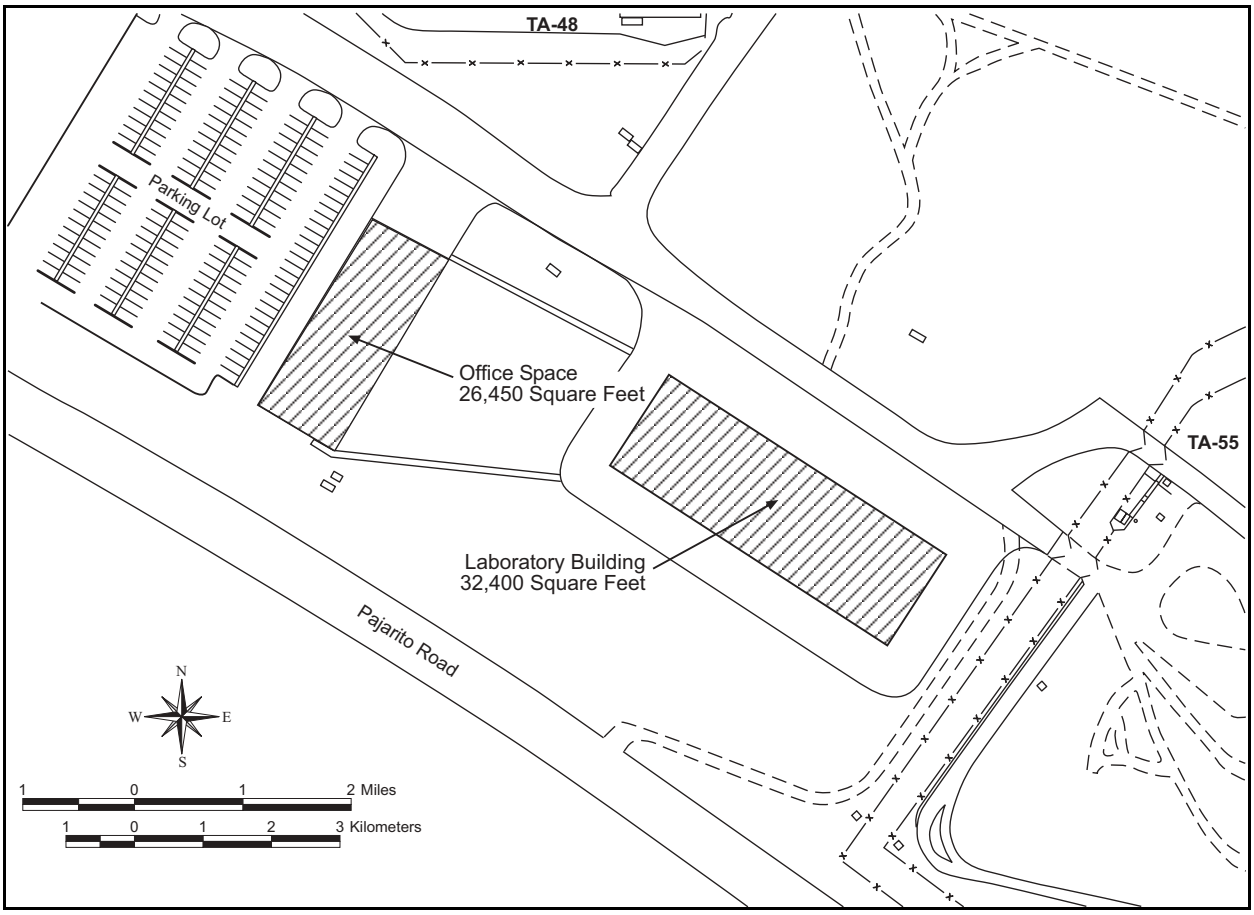

Figure 5–2 Location of the Proposed Facilities for the Relocation of Security Category III/IV Activities at LANL's TA-55

detonation is used, and up to 2,000 kilograms (4,400 pounds) of explosives may be used in a single test. In the past, contained testing involving plutonium was performed at the site. Facilities at TA-39 include offices, laboratories, shops, magazines, firing sites, a gas-gun facility, and a storage and assembly building (DOE 1999b). Test facilities are located at the bottom of Ancho Canyon because the deep canyon and steep walls isolate explosives tests from the public.

Visual Resources—TA-39 is located in the southeastern portion of LANL. Due to topographic variation, the area presents dramatic views of deep canyons with steep walls giving way to mesas at higher elevations. Most of the area is in a natural state with development restricted to a few isolated locations. The Cerro Grande Fire did not burn across TA-39 (DOE 2000g). Developed areas within TA-39 are not visible from offsite locations. Due to the general lack of development at TA-39, the Bureau of Land Management Visual Resource Contrast rating would vary (depending on the specific viewpoint) between Class II and Class III.

Site Infrastructure

Vehicular access to the site is provided by Ancho Road from State Road 4. Utilities including electric power, water, and natural gas serve the TA-39 Ancho Canyon facilities. In fiscal year 2000, TA-39 used 306 megawatt-hours of electricity. Natural gas usage is estimated to be about 45 cubic meters (1,600 cubic feet) per year (LANL 2001a).

Air Quality and Noise

A description of current air quality conditions at LANL, including TA-18, TA-39, and TA-55, was addressed previously in Section 4.2.3. Existing noise sources associated with TA-39 activities that could affect publicly detectable noise levels include vehicles and high-explosives testing. Topographic and geologic features effectively mitigate much of the noise and vibration associated with activities at TA-39. The *LANL SWEIS* discusses these noise sources in further detail. Background noise levels at the adjacent Bandelier National Monument are low, as discussed in Section 4.2.4.

Geology and Soils

The stratigraphy of the TA-39 Ancho Canyon site is expected to be fairly representative of other canyon sites within LANL, with unconsolidated alluvial sediments (e.g., gravel, sand, silt, and clay) comprising the canyon bottom that overlies poorly welded and highly weathered volcanic tuff. Welded tuff typically comprises the canyon walls. Soils derived from these parent materials are typically sandy loams. Three faults associated with the Pajarito Fault Zone (i.e., Pajarito, Rendija Canyon, and Guaje Mountain) are considered capable (10 CFR 100, Appendix A). The closest known fault to TA-39 is the Pajarito Fault, which is located approximately 8 kilometers (5 miles) west of TA-39 (see Figure 4–3 and Section 4.2.5) (DOE 1999b).

Water Resources

Surface Water—There are no natural surface water bodies in the vicinity of the TA-39 Ancho Canyon facilities. The Ancho Canyon arroyo is ephemeral along most of its length as it traverses TA-39 from northeast to southwest. However, it becomes perennial along its lowermost reach to its confluence with the Rio Grande at TA-33 (DOE 1999b). Two NPDES outfalls to Ancho Canyon from TA-39 high-explosives testing facilities were eliminated in 1997 (LANL 2000e, DOE 1999b). Storm-water runoff and surface water quality within Ancho Canyon and other LANL canyons is monitored to evaluate the effects of LANL facility operations (see Section 4.2.6.1).

Groundwater—Groundwater across LANL occurs in the relatively shallow canyon-bottom alluvium as intermediate perched groundwater, and deeper in the main (regional) aquifer. The depth to perched groundwater bodies in the canyons has been found to range from 27 to 137 meters (90 to 450 feet) (DOE 1999b). Monitoring-well R-31 is located in Ancho Canyon at TA-39. The Environmental Restoration Project has also installed numerous shallow wells near landfills at TA-39.

Ecological Resources

Terrestrial Resources—TA-39 is located in the Pinyon-Juniper Woodland vegetation zone. However, vegetation within the area varies with elevation, with pinyon-juniper woodland present in the 1,900- to 2,100-meter (6,200- to 6,900-foot) elevation range and ponderosa pine woodland found in the 2,100- to 2,300-meter (6,900- to 7,500-foot) elevation range (DOE 1996f). Development within TA-39 is restricted to a few isolated locations, a number of which occur along Ancho Road at the bottom of the Ancho Canyon. Vegetation within the canyon is pinyon-juniper woodland. TA-39 was not burned during the Cerro Grande Fire. Wildlife typical of pinyon-juniper woodlands includes the Cassin's kingbird, cliff swallow, coyote, and mule deer. Animals found within the ponderosa pine community at higher elevations of TA-39 include the Western bluebird, solitary vireo, raccoon, and mountain lion (DOE 1999b, DOE 2000g).

Wetlands—There is one wetland located in the southeastern portion of TA-39 where it borders TA-33. The wetland is characterized by vegetation and other components similar to these found in the wetland associated with TA-18 (see Section 4.2.7.2).

Aquatic Resources—There are no aquatic resources within TA-39.

Threatened and Endangered Species—No threatened and endangered species or their critical habitat have been found to date at TA-39.

Cultural and Paleontological Resources

Prehistoric Resources—Based on previous cultural resource surveys, archaeological sites have been identified throughout TA-39. One archaeological site is located to the east-southeast of existing Building 6 and another two archaeological sites are located to the west of the proposed location for the new control and training building in conjunction with relocating SHEBA to Building 6.

Another archaeological site, eligible for nomination to the National Register of Historic Places, is located in a fenced area near the proposed security Category III/IV office building and parking lot at TA-55.

No historic or paleontological resources have been found at TA-39.

Socioeconomics

The socioeconomic characteristics of the region surrounding TA-39 are presented in Section 4.2.9.

Environmental Justice

Minority and low-income population statistics for the region surrounding TA-39 are presented in Section 4.2.10.

Radiation Exposure

Major sources and levels of background radiation exposure to individuals in the vicinity of LANL were previously discussed in Section 4.2.11.1. External radiation doses have been measured in areas surrounding TA-39 that may contain radiological sources for comparison with offsite natural background radiation levels. Measurements taken in 1999 showed an average onsite dose in the vicinity of TA-39 of 183 millirem, compared to an average offsite dose of 126 millirem (LANL 2000f).

Waste Management

Two locations within TA-39, firing sites 6 and 57, currently operate as open detonation sites for treatment of hazardous waste under RCRA interim status. Additionally, there are approximately 25 potential release sites at TA-39, 14 of which are solid-waste management units subject to RCRA corrective action standards and the Hazardous and Solid Waste Amendment provisions of LANL's Hazardous Waste Facility Permit. The latter group includes firing sites 6 and 57. The environmental restoration program's current baseline for cleanup activities at TA-39 will begin in fiscal year 2006. If SHEBA is relocated to Building 6 (firing site 6) at TA-39, the site would require characterization and closure with a potential need for a postclosure permit and associated monitoring.

5.6.3 Environmental Impacts

The following subsections address the environmental impacts associated with the potential relocation of SHEBA from TA-18 to TA-39 and other security Category III/IV activities to TA-55. The environmental impacts associated with the relocation of SHEBA and other security Category III/IV activities at LANL should be considered in conjunction with the impacts associated with the relocation of security Category I/II activities, as discussed in Section 5.2, LANL New Facility Alternative, and Sections 5.3, 5.4, and 5.5. The environmental impacts associated with SHEBA and other security Category III/IV activities remaining at TA-18 are considered to be bounded by the impacts described for the No Action and TA-18 Upgrade Alternatives evaluated in detail in Section 5.2.

5.6.3.1 Land Resources

Land Use

Construction Impacts—A small amount of land (approximately 0.08 hectares [0.2 acres]) would be disturbed, should SHEBA be relocated to TA-39, regardless of whether SHEBA is located on top of an existing or new bunker building. Water and gas lines and a septic tank and leach field would be needed to support the proposed new control and training building and would use existing utility corridors where possible.

Should security Category III/IV activities be relocated to TA-55, a laboratory, office buildings, and a 200-vehicle parking lot would be built on a 3.2-hectare (8-acre) site located outside of the current TA-55 PIDAS. The construction of these buildings and a parking lot, including a construction lay-down area, would occupy about 1.6 hectares (4 acres) of this site. This proposed action is compatible with the current Research and Development land-use designation of TA-55.

Operations Impacts—Operations of these new facilities would be compatible with current land use at both TA-39 and TA-55, as well as their present land-use designations. Thus, there would be no measurable impact on land use during the operational phase of the proposed action.

Visual Resources

Construction Impacts—Although some impact on visual resources may result from the presence of construction equipment and dust at TA- 39 and TA-55, these impacts would be temporary and not visible at any offsite location.

Operations Impacts—The presence of new buildings and/or modification of Building 6 at TA-39 would result in little change in the appearance of the area. Thus, the overall Class II to Class III Bureau of Land Management Visual Resource Management rating of TA-39 would not change as a result of relocation.

New buildings at TA-55 would add to the visual impact of development at TA-55. While not visible from lower elevations, new development would be visible from higher elevations to the west along the upper reaches of the Pajarito Plateau rim. As a result of the Cerro Grande Fire, visibility of newly built structures (as well as the entire TA-55 area) would be greater than would have been the case before the fire. However, regardless of the effects of the fire, the Class IV Bureau of Land Management Visual Resource Management rating of the area would not change as a result of relocation.

5.6.3.2 Site Infrastructure

Construction Impacts—The projected demands on key infrastructure resources associated with the construction of new SHEBA and security Category III/IV buildings at LANL are presented in **Table 5–46**. Currently, existing LANL infrastructure would be capable of supporting the construction requirements without exceeding site capacities. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, it is expected that fuel would be procured from offsite sources and, therefore, is not a limited resource.

Table 5–46 Site Infrastructure Requirements for Facility Construction for Relocation of SHEBA and Other Security Category III/IV Activities

Resource	*Available Site Capacity* [a]	*SHEBA* [b]		*Security Category III/IV* [b]	
		Requirement	*Percent of Available Site Capacity*	*Requirement*	*Percent of Available Site Capacity*
Electricity					
Energy (megawatt-hours per year)	461,132	5.2	0.001	26	0.006
Peak load (megawatts)	24	0.013	0.054	0.026	0.11
Fuel					
Gasoline and diesel (liters per year) [c]	Not limited	Negligible	Not limited	Negligible	Not limited
Water (liters per year)	335,000,000	34,100	0.01	4,656,000	1.4

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 5–1, *TA-18 Relocation EIS*.
[b] Represents total rather than annualized values as the low-end projected period of construction ranges from 6 months for SHEBA to 12 months for security Category III/IV facilities.
[c] Not limited due to offsite procurement.
Sources: Table 5–1, *TA-18 Relocation EIS*; LANL 2001a.

Operations Impacts—Resources needed to support operation of SHEBA at TA-39 and new security Category III/IV buildings at TA-55 are presented in **Table 5–47**. It is projected that all other existing LANL infrastructure resources would be adequate to support proposed operational activities over 25 years. In general, total infrastructure requirements would be a small fraction of those projected under the No Action Alternative (see Section 5.2.2), with operational demands for security Category III/IV activities not easily separated out and bounded by that alternative. Therefore, they are considered "negligible" for the purpose of analysis.

5.6.3.3 Air Quality

Nonradiological Releases

Construction Impacts—Construction of new buildings and/or modification of an existing building at TA-39 for SHEBA would result in an increase in air quality impacts from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations for construction of a new building assumed to be located in the central part of TA-39 were modeled and compared to the most stringent standards (see Table 5–48). Concentrations of criteria pollutants from the construction of new buildings at other locations north of the main TA-39 support facilities and along the road are expected to be similar. The maximum ground-level concentrations that would result from construction would be below the ambient air quality standards. The maximum short-term concentrations would occur at receptors to the southwest along the LANL boundary adjacent to Bandelier National Monument. The maximum annual concentrations would occur at a receptor east of TA-39 along Route 4. Modeling of construction air quality considered particulate

emissions from activity in a construction area of 0.08 hectares (0.2 acres) and emissions from various earthmoving and materials-handling equipment.

Table 5–47 Site Infrastructure Requirements for Facility Operations for Relocation of SHEBA and Other Security Category III/IV Activities

Resource	*Available Site Capacity* [a]	*SHEBA* [b]		*Security Category III/IV* [b]	
		Requirement	*Percent of Available Site Capacity*	*Requirement*	*Percent of Available Site Capacity*
Electricity					
Energy (megawatt-hours per year)	461,132	Negligible	Negligible	Negligible	Negligible
Peak load (megawatts)	24	Negligible	Negligible	Negligible	Negligible
Fuel					
Natural gas (cubic meters per year)	159,400,000	Negligible	Negligible	Negligible	Negligible
Liquid fuel (liters per year) [c]	Not limited	Negligible	Not limited	Negligible	Not limited
Coal (metric tons per year)	Not applicable	0	Not applicable	0	Not applicable
Water (liters per year)	335,000,000	Negligible	Negligible	Negligible	Negligible

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 5–1, *TA-18 Relocation EIS*.
[b] Values would be a small fraction of the requirements projected under the No Action Alternative.
[c] Not limited due to offsite procurement.
Sources: Table 5–1, *TA-18 Relocation EIS*; LANL 2001a.

Construction of new buildings at TA-55 for the relocation of TA-18 security Category III/IV activities would result in an increase in air quality impacts from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations for construction were modeled and compared to the most stringent standards (see **Table 5–48**). The maximum ground-level concentrations that would result from construction would be below the ambient air quality standards, except for short-term concentrations of PM_{10} and total suspended particulates that could be above the standard at receptors adjacent to the site along Pajarito Road. Actual construction concentrations are expected to be less because conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The maximum short-term concentrations would occur at a receptor on Pajarito Road adjacent to the construction area. The maximum annual concentrations would occur at a receptor to the north of TA-55 along the LANL boundary. Computer modeling of construction air quality considered particulate emissions from activity in a construction area of 1.7 hectares (4.1 acres) for security Category III/IV activities and emissions from various earthmoving and materials-handling equipment. Measures that could be used to mitigate construction emissions are discussed in Section 5.9.

Modification of buildings and infrastructure to maintain security Category III/IV activities at TA-18 could result in some increase in criteria pollutant emissions and concentrations. These impacts would be bounded by the construction air quality impacts described under the TA-18 Upgrade Alternative in Section 5.2.3.1.

Operations Impacts—Small quantities of toxic air pollutants could be generated from SHEBA and security Category III/IV activities. These emissions are discussed in Section 5.6.3.10, Public and Occupational Health and Safety.

Table 5–48 Nonradiological Air Quality Concentrations at TA-39 for SHEBA and TA-55 for Security Category III/IV Activities – Construction

	Averaging Period	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration from TA-55 (micrograms per cubic meter)* [b]	*Maximum Incremental Concentration from TA-39 (micrograms per cubic meter)* [b]
Carbon monoxide	8 Hours 1 Hour	7,800 11,700	123 703	71.5 572
Nitrogen dioxide	Annual 24 Hours	73.7 147	0.25 69	0.081 19.7
PM_{10}	Annual 24 Hours	50 150	1.25 154	0.016 2.95
Sulfur dioxide	Annual 24 Hours 3 Hours	41 205 1,030	0.02 6.62 41.3	0.007 1.97 15.8
Total suspended particulates	Annual 24 Hours	60 150	2.47 303	0.026 4.14

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The National Ambient Air Quality Standards (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million. These values have been converted to micrograms per cubic meter with appropriate corrections for temperature (21 °C [70 °F]) and pressure (elevation 2,135 meters [7,005 feet]), following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The annual concentrations were analyzed at locations to which the public has access—the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

Sources: DOE 1999b, LANL 2001a.

Radiological Releases

Construction Impacts—While no radiological releases to the environment are expected in association with construction activities at TA-39 and TA-55, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Prior to commencing ground disturbance, the National Nuclear Security Administration would survey potentially affected areas to determine the extent and nature of any contamination and would be required to remediate any contamination in accordance with state and Federal regulations, LANL's Hazardous Waste Facility Permit, and procedures established under LANL's environmental restoration program. Remediation would be conducted so that additional soil contamination would be minimized.

Operations Impacts—Approximately 100 curies per year of argon-41 would be released from the relocated SHEBA activities at TA-39 (see Section 3.2.1). There would be no radiological releases from the relocated security Category III/IV activities at TA-55 or at TA-18. Impacts on public and occupational health and safety from radiological releases are described in Section 5.6.3.10.

5.6.3.4 Noise

Construction Impacts—Construction of new buildings at TA-39 and TA-55 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of the operation of construction equipment. There would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments. Noise sources associated with construction at TA-39 and TA-55 are not expected to include loud impulsive sources such as blasting.

Operations Impacts—Noise impacts from relocated SHEBA and security Category III/IV activities at TA-39 and TA-55 are expected to be similar to existing operations at these areas. Although there would be a small increase in traffic noise and equipment noise (e.g., heating and cooling systems and generators) near the areas, there would be little change in noise impacts on wildlife and no change in noise impacts on the public outside of LANL as a result of moving these activities to TA-39 and TA-55.

5.6.3.5 Geology and Soils

Construction Impacts—Since less than about 0.2 hectares (0.5 acres) of previously disturbed land would be used to house relocated SHEBA activities, impacts on geology and soils at TA-39 are expected to be negligible. The potential also exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, potentially affected areas would be surveyed to determine the extent and nature of any contaminated media and required remediation in accordance with state and Federal regulations, LANL's Hazardous Waste Facility Permit, and procedures established under LANL's environmental restoration program.

Potential overall impacts on geology and soils at TA-55 and TA-39 from construction activities would be minor, with the risk to proposed facilities from large-scale geologic conditions at LANL expected to be similar to that discussed in Section 5.2.5.

Operations Impacts—The operations of relocated SHEBA and other security Category III/IV activities at TA-39 and TA-55, respectively, would not be expected to result in impacts on geologic and soil resources at LANL. The new facilities would be designed and constructed in accordance with DOE Order 420.1 and sited to minimize the risk from geologic hazards. Thus, site geologic conditions would be unlikely to affect the facilities.

5.6.3.6 Water Resources

Surface Water

Construction Impacts—The reach of Ancho Canyon in the vicinity of TA-39 is ephemeral and not a viable source of water, and no surface water would be used to support facility construction. All activities planned for TA-39 would occur on the canyon bottom, and Building 6 is located immediately adjacent to a dry stream bed. There are no natural surface water drainages at TA-55 that would be impacted by security Category III/IV activities. In addition, appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) and spill prevention practices would be employed during construction at both TA-39 and TA-55 to minimize suspended sediment and material transport and any potential downstream water quality impacts. It is expected that portable toilets would be used for construction personnel at both sites, resulting in no onsite discharge of sanitary wastewater and no impact on surface waters.

Operations Impacts—Relocated SHEBA and other security Category III/IV activities at TA-39 and TA-55, respectively, would not be expected to result in impacts on surface water resources, as there are no natural surface water features present at either site. The design and operations of the modified and new facilities would also incorporate appropriate storm-water management controls to safely collect and convey storm water from facilities while minimizing washout and soil erosion. The only liquid effluent associated with these activities consists of sanitary wastewater. No industrial effluent would be discharged to the surface or subsurface at either TA-39 or TA-55. Overall, operations impacts on site surface waters and downstream water quality are expected to be negligible.

Groundwater

Construction Impacts—Groundwater would be required to support construction activities at both TA-39 and TA-55 and would be obtained from the existing potable water lines and trucked to the point of use (LANL 2001a). As shown in Table 5–46, the volume of groundwater required for construction would be minimal compared to site availability, and there would be no onsite discharge of wastewater to the surface or subsurface. Construction dewatering is not expected to be necessary at either TA-39 or TA-55, as all excavation work would occur at a relatively shallow depth, with the proposed new buildings constructed on poured concrete slabs and footings (LANL 2001a). Also, appropriate spill prevention controls, countermeasures, and procedures would be employed to minimize the potential for releases of materials to the surface or subsurface. As a result, no impact on groundwater availability or quality is anticipated from construction activities at either TA-39 or TA-55.

Operations Impacts—Facilities housing relocated SHEBA and other security Category III/IV activities at TA-39 and TA-55, respectively, would use groundwater primarily to meet the potable and sanitary needs of facility support personnel, as well as for miscellaneous building mechanical uses. As shown in Table 5–47, the incremental volume of groundwater required on an annualized basis to support these activities would be negligible compared to site availability. Therefore, no additional impacts on regional groundwater availability are anticipated.

Sanitary wastewater would be generated as a result of facility operations stemming from facility staff use of lavatory facilities, and from miscellaneous potable and sanitary uses. At TA-39, the new control and training building to support SHEBA operations would be served by a new septic tank and leach field (LANL 2001a). Although sanitary effluent would be discharged to the subsurface at TA-39, disposal would be via an approved septic tank and leach field. At TA-55, sanitary wastewater would be collected and conveyed to existing wastewater treatment facilities for ultimate disposal. No industrial effluent would be discharged to the surface or subsurface at either TA-39 or TA-55. Thus, no operations impacts on groundwater quality are expected.

5.6.3.7 Ecological Resources

Terrestrial Resources

Construction Impacts—The relocation of SHEBA and other security Category III/IV activities to TA-39 and TA-55, respectively, is not expected to directly affect terrestrial resources. Indirect impacts (e.g., noise) would be temporary. New water and gas mains required to support the new control and training building would follow roadways and existing utility corridors as much as possible.

Operations Impacts—SHEBA operations and other security Category III/IV activities at TA-39 and TA-55, respectively, would not adversely impact either wildlife or wildlife habitat at either site because relocated activities would not produce emissions or effluent of a quality and level that would adversely affect wildlife.

Wetlands

Construction and Operations Impacts—Construction and operations of new buildings would not directly impact the one wetland located at the eastern end of TA-39 or the three wetlands located within TA-55. Further, storm-water runoff, erosion, and sediment control measures would be undertaken during construction to ensure that indirect impacts would be avoided.

Aquatic Resources

Construction and Operations Impacts—There are no aquatic resources located at either TA-39 or TA-55; thus, direct impacts on these resources would not occur. Indirect impacts on aquatic resources located down-gradient from these areas would be prevented by implementation of appropriate storm-water runoff, erosion, and sediment control measures.

Threatened and Endangered Species

Construction and Operations Impacts—A review of a threatened and endangered species report for the *TA-18 Relocation EIS* concluded that construction and operations associated with SHEBA and security Category III/IV activities at TA-39 and TA-55 may affect, but are not likely to adversely affect, individual Mexican spotted owls or their potential critical habitat. It was further concluded that the proposed action would fall within those actions described as acceptable in the LANL Threatened and Endangered Species Habitat Management Plan. No additional informal or formal consultation by DOE with the U.S. Fish and Wildlife Service is required (LANL 2001a).

5.6.3.8 Cultural and Paleontological Resources

Construction and Operations Impacts—As previously described in the affected environment discussion in Section 5.6.2, archaeological sites have been identified at TA-39 in the vicinity of the two buildings proposed to house the relocated SHEBA operations. Based on current maps of both locations, these sites would be avoided by the proposed action (LANL 2001a). Should Building 6 at TA-39 not be used for the relocation of SHEBA, the new bunker building would be sited away from any archaeological sites to avoid impacting cultural resources. SHEBA operations and the new control and training facilities would not affect any cultural resources at TA-39.

The archaeological site at TA-55, eligible for nomination to the National Register of Historic Places, is located in a fenced area in the vicinity of the proposed location for the security Category III/IV facilities. This archaeological site includes a buffer zone around the site and would be permanently fenced prior to the start of any construction and operations activities in the area. This archaeological site would remain fenced during operations associated with security Category III/IV activities at TA-55 (LANL 2001a).

5.6.3.9 Socioeconomics

Construction Impacts—Construction of new buildings at TA-39 and construction of a laboratory and office building at TA-55 would require a peak construction employment level of 70 workers. This level of employment would generate about 199 indirect jobs in the region around LANL. The potential total employment increase of 269 direct and indirect jobs represents an approximate 0.3 percent increase in the workforce and would occur only over the 18 months of construction. It would have no noticeable impact on the socioeconomic conditions of the region of influence.

Operations Impacts—SHEBA would continue to conduct experiments and tests in all areas. Current levels of employment would continue. No new employment or in-migration of workers would be required. Therefore, there would be no additional impact on the socioeconomic conditions around LANL.

5.6.3.10 Public and Occupational Health and Safety

The assessments of potential radiological impacts associated with relocation of SHEBA activities to LANL's TA-39 are presented in this section. Radiological impacts from relocated security Category III/IV activities

at TA-55 would be bounded by the impacts described for the LANL New Facility Alternative in Section 5.2.10. No chemical-related health impacts are associated with any TA-18 operations because only very small quantities of industrial-type chemicals, such as ethanol, isopropyl alcohol, magnesium oxide, phenylphosphine, and xylene, would be used. As stated in the *LANL SWEIS*, the quantities of these chemicals that could be released to the atmosphere during normal operations are minor and would be below the screening levels used to determine the need for additional analysis. There would be no operational increase in the use of these chemicals as a result of the proposed action. No chemicals have been identified that would be a risk to members of the public from construction activities associated with any of the LANL alternatives. Construction workers would be protected from hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. The potential occupational (industrial) impacts to workers during construction and operations were evaluated based on DOE and Bureau of Labor statistic data and are detailed in Appendix C, Section C.7. Construction and operations activities under this alternative are expected to result in some injuries but no fatalities to workers for the duration of the proposed action (i.e., about 3 years of construction and 25 years of operations).

Summaries of radiological impacts from normal operations and postulated accidents are presented below. The methodologies used to determine the health effects on the public and facility workers are presented in Appendix B. Supplemental information associated with normal operations and postulated accidents is provided in Appendices B and C, respectively.

Construction and Normal Operations

Construction Impacts—No radiological risks would be incurred by members of the public from relocation or construction activities. Construction workers may be at a small risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as is reasonably achievable.

Operations Impacts—The only radiological release associated with SHEBA operations at TA-39 would be approximately 100 curies per year of argon-41 to the atmosphere (see Section 5.6.3.3). Trace quantities of other radionuclides may be released during operations involving the handling of security Category III/IV materials. However, health impacts from the releases associated with these activities are expected to be much smaller than those associated with SHEBA operations. Therefore, only the 100-curies-per-year release of argon–41 associated with SHEBA operations has been quantified. The associated calculated impacts on the public are presented in **Table 5–49**. The only dose pathway to the public would be from immersion in the passing plume. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

As shown in the table, the expected annual radiation dose to the maximally exposed individual member of the public would be much smaller than the limit of 10 millirem per year set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a cancer fatality to this individual from operations would be approximately 3.0×10^{-8} per year (i.e., about 1 chance in 30 million per year of a latent cancer fatality). The projected number of fatal cancers for the population within 80 kilometers (50 miles) would be 0.000044 per year (i.e., about 1 chance in 20,000 per year of a latent cancer fatality).

Table 5–49 Annual Radiological Impacts on the Public from SHEBA Operations at TA-39

Receptor	*Impact Values*
Population within 80 Kilometers (50 Miles)	
Collective dose (person-rem)	0.087
Percent of natural background radiation [a]	0.000054
Cancer fatalities [b]	0.000044
Maximally Exposed Offsite Individual	
Dose (millirem)	0.061
Percent of regulatory dose limit [c]	0.61
Percent of natural background radiation [a]	0.017
Cancer fatalities risk [b]	3.1×10^{-8}
Average Individual within 80 Kilometers (50 Miles)	
Dose (millirem)	0.00019
Percent of natural background radiation [a]	0.000054
Cancer fatalities risk [b]	1.0×10^{-10}

[a] The average annual dose from background radiation at LANL is 360 millirem (Section 4.2.11.1); the 450,000 people living within 80 kilometers (50 miles) of the TA-39 site would receive an annual dose of 162,000 person-rem from the background radiation.
[b] Based on a cancer risk estimate of 0.0005 latent cancer fatalities per person-rem (see Appendix B).
[c] This comparison cannot be made for the population and average individual because there is no standard or limit.

Because SHEBA operations are performed in a "free-field" environment—with no radiation shielding—it is not possible to design the facility to ensure that direct radiation would not impact the public to some degree. However, the administrative controls currently in use at TA-18 would continue to be applied to a relocated SHEBA facility at TA-39. TA-39 was selected in part because of its relative remoteness; the nearest distance to a public road is 800 meters (see Appendix C, Section C.2), which is twice that at TA-18. Since the direct dose falls off with distance roughly at the rate of $1/R^2$, where R is distance from the critical assembly machine (i.e., SHEBA), the maximum direct dose to an individual would be about 1 millirem.

Annual radiological doses to workers involved with SHEBA operations at TA-39 are identical to the impacts shown for SHEBA and other security Category III/IV activities under the No Action Alternative, as described in Section 5.2.10.1. As shown in that section, the annual doses to individual workers would be well below the DOE limit of 5,000 millirem (10 CFR 835); the DOE Control Level of 1,000 millirem per year, as established in 10 CFR 835.1002; and the DOE recommended Administrative Control Level of 500 millirem (DOE 1999c). The projected number of fatal cancers in the workforce from operations would be 0.0045 per year (or 1 chance in 220 that the worker population would experience a fatal cancer per year of operations).

Facility Accidents

SHEBA operations would be relocated to new facilities in TA-39. The SHEBA machine would always be aboveground. The radioactive liquid material would remain belowground except for use during an experiment, when it would be pumped to the SHEBA machine. From an accident perspective, the SHEBA machine, associated materials, and equipment are assumed to have the same potential for accidents as at the existing TA-18 location. Certain scenario parameter values applicable to the No Action Alternative, such as leak path factors, materials at risk, and the corresponding source term, have been adjusted to reflect improved safety features of the new facility.

Radiological Impacts—**Table 5–50** shows the frequencies and consequences of the postulated set of accidents for a noninvolved worker and the public (maximally exposed individual and the general population living within 80 kilometers [50 miles] of the facility). **Table 5–51** shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *TA-18 BIO*

(DOE 2001a). The selection process and screening criteria used (as described in Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur at TA-18 facilities. Consideration has also been given to the possibility of an accident at a TA-39 collocated facility that could initiate an accident at the new SHEBA facility. Because of the location of the new SHEBA facility and the distance to any nearby facilities, it was determined that there were no reasonably foreseeable collocated accidents that could affect SHEBA. Thus, in the event that any other accident not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

The accident with the highest risk to the offsite population (see Table 5–51) would be a hydrogen detonation in SHEBA accident. The increased number of latent cancer fatalities in the offsite population would be 4.9×10^{-5} per year (i.e., about 1 chance in 20,400 per year of a latent cancer fatality). The highest risk of a latent cancer fatality to the maximally exposed offsite individual would be 1.4×10^{-7} per year (i.e., about 1 chance in 7 million per year of a latent cancer fatality). The highest risk of a latent cancer fatality to a noninvolved worker located at a prescribed standoff distance of 400 meters (437 yards) from the accident would be 2.0×10^{-6} per year (i.e., about 1 chance in 500,000 per year of a latent cancer fatality).

Table 5–50 Accident Frequency and Consequences from the Relocation of SHEBA

		Maximally Exposed Offsite Individual		*Offsite Population* [a]		*Noninvolved Worker*	
	Frequency (per year)	*Dose (rem)*	*Latent Cancer Fatalities* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatalities* [b]
Uncontrolled reactivity insertion in SHEBA in burst mode							
	1.0×10^{-6}	18.0	0.009	6,300	3.54	340	0.27
Hydrogen detonation in SHEBA accident							
	5.4×10^{-3}	0.051	2.5×10^{-5}	18.0	9.0×10^{-3}	0.91	0.00037
Earthquake-induced facility failures without fire accident							
	1.0×10^{-4}	0.32	0.000016	14.3	0.0072	0.57	0.00023
Inadvertent solution criticality in SHEBA accident							
	1.0×10^{-6}	0.00014	7.0×10^{-8}	0.052	2.6×10^{-5}	0.0018	7.2×10^{-7}

[a] Based on a population of 450,302 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table 5–51 Annual Cancer Risks Due to Accidents from the Relocation of SHEBA

Accident	*Maximally Exposed Offsite Individual* [a]	*Offsite Population* [b, c]	*Noninvolved Worker* [a]
Uncontrolled reactivity insertion in SHEBA in burst mode	9.0×10^{-9}	3.5×10^{-6}	2.7×10^{-7}
Hydrogen detonation in SHEBA	1.4×10^{-7}	4.9×10^{-5}	2.0×10^{-6}
Earthquake-induced facility failures without fire	1.6×10^{-9}	7.2×10^{-7}	2.3×10^{-8}
Inadvertent solution criticality in SHEBA	7.0×10^{-14}	2.6×10^{-11}	7.2×10^{-13}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 450,302 persons residing within 80 kilometers (50 miles) of the site.

Hazardous Chemicals and Explosives Impacts—There would be no hazardous chemicals or explosives used or stored at TA-39 associated with SHEBA activities, other than minor industrial quantities, that would impact workers or the public under accident conditions.

Involved Worker Impacts

Approximately 50 workers would be located at the new SHEBA facility. During criticality experiments, workers would be safely located beyond a prescribed distance from the experiments.

Workers in the vicinity of an accident could be at risk of serious injury or fatality. The impacts from the uncontrolled reactivity insertion in SHEBA in a burst-mode accident would be typical of worker impacts during accident conditions.

Facility operating procedures prohibit personnel from being in the test facility during remote operation of SHEBA. If an accident were to occur during a test run due to improper experiment setup and/or a combination of operator errors from the control room, the involved workers would be in the remote-control room and no workers would be present in the test facility. Workers in the remote-control room would be protected by a combination of shielding and distance from the immediate impacts of the accident. The remote-control room engineered safety features and/or protective actions taken by the control-room staff to limit contamination of the control-room environment protects the involved workers.

In the event that workers in the bay area setting up the test were to initiate a criticality accident, it is anticipated these workers would be subject to serious injury or fatality as a result of the accident. Since the facility operating procedures would not prohibit workers from being in adjacent areas during operations, it is anticipated that workers in the vicinity outside of the bay would receive an estimated dose of less than 200 millirem after an uncontrolled criticality event. (This is estimated based on the potential energy released during this accident in relation to that used to design the shielding requirements.)

Following initiation of accident and site emergency alarms, workers would be evacuated from the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological risk of injury.

5.6.3.11 Environmental Justice

Construction Impacts—There would be no disproportionately high and adverse environmental impacts on minority and low-income populations due to construction if SHEBA and other security Category III/IV activities were relocated to LANL's TA-39 and TA-55, respectively. As stated in other subsections of Section 5.6.3, environmental impacts from construction would be small and would not be expected to extend beyond the LANL site boundary.

Operational Impacts—No disproportionately high and adverse environmental impacts on minority and low-income populations would occur if SHEBA and other security Category III/IV activities were relocated to LANL's TA-39 and TA-55, respectively. This conclusion is a result of analyses presented in this EIS that determined there were no significant impacts on human health, ecological, cultural, paleontological, socioeconomic, and other resource areas described in other subsections of Section 5.6.3.

During normal operations, approximately 100 curies of the noble gas argon-41 could be activated in the atmosphere by SHEBA activities. As a result, impacts measured in terms of latent cancer fatalities on the general population would be small, as indicated in Table 5–49. Additionally, subsistence consumption of crops and wildlife radiologically contaminated with argon-41 would not be harmful, since argon-41 has a half-life of 1 hour and 48 minutes and decays into a stable isotope of potassium that is not harmful to human health in small quantities.

Columns 2 and 3 of Table 5–51 show the radiological risks to the maximally exposed offsite individual and offsite population, respectively, that could result from postulated accidents during SHEBA operations at TA-39. All of these risks are at least four orders of magnitude less than one latent cancer fatality. Hence, none of the postulated accidents would pose a significant radiological risk to the public, including minority and low-income individuals and groups within the population at risk.

5.6.3.12 Waste Management

In accordance with the Records of Decision for the *Waste Management PEIS* (DOE 1997a), waste could be treated and disposed of on site at LANL or at other DOE sites or commercial facilities. Based on the Record of Decision for hazardous waste published on August 5, 1998 (63 FR 41810), nonwastewater hazardous waste will continue to be treated and disposed of at offsite commercial facilities. Based on the Record of Decision for low-level radioactive waste and mixed low-level radioactive waste published on February 18, 2000 (65 FR 10061), minimal treatment of low-level radioactive waste will be performed at all sites, and, to the extent practicable, onsite disposal of low-level radioactive waste will continue. Hanford and NTS will be made available to all DOE sites for disposal of low-level radioactive waste. Mixed low-level radioactive waste analyzed in the *Waste Management PEIS* will be treated at Hanford, INEEL, the Oak Ridge Reservation, and the Savannah River Site and will be disposed of at Hanford and NTS.

It is assumed in this EIS that low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous waste would be treated, stored, and disposed of in accordance with current and developing site practices. No high-level radioactive or transuranic waste is generated from the operations of SHEBA.

As previously discussed in Section 5.6.2, two locations within TA-39, firing sites 6 and 57, currently operate as open detonation sites for treatment of hazardous waste under RCRA interim status. In addition, approximately 25 potential release sites and 14 solid waste management units, subject to RCRA corrective action standards and the Hazardous and Solid Waste Amendment provisions of LANL's Hazardous Waste Facility Permit, have been identified at TA-39. As a result, any new construction or activity at TA-39 involving these types of solid waste management units would require approval by the New Mexico Environmental Department. Partial or total cleanup of TA-39 may generate substantial quantities of solid and hazardous waste; however, these waste volumes are outside the scope of this EIS. If SHEBA is relocated to Building 6 (firing site 6) at TA-39, the site will require characterization and closure with a potential need for a postclosure permit and associated monitoring. The remediation of TA-39 would be managed under LANL's environmental restoration program and would include appropriate documentation. Therefore, potential waste generated from such remediation activities is not included in the *TA-18 Relocation EIS* analyses.

Construction Impacts—Only hazardous and nonhazardous waste types are expected to be generated from the construction activities associated with relocating SHEBA activities to LANL's TA-39. Only nonhazardous waste is expected to be generated from construction activities associated with relocating security Category III/IV activities to LANL's TA-55. The impacts on the LANL waste management systems, in terms of managing the waste, are discussed in this section. Radiological and chemical impacts on workers and the public from waste management activities are included in the public and occupational health and safety impacts provided in Section 5.6.3.10.

Hazardous waste generated from construction activities to relocate SHEBA to LANL's TA-39 would be decontaminated or recycled to the extent practicable. The remaining waste would be packaged and shipped to offsite RCRA-permitted treatment and disposal facilities. Typically, hazardous waste is not held in long-term storage at LANL. About 450 kilograms (990 pounds) of hazardous waste would be generated from the

removal and replacement of an existing transformer in Building 6 at TA-39 (LANL 2001a). This waste represents about 0.05 percent of the annual waste generation rate for the entire LANL site—860,600 kilograms (1,900,000 pounds) per year. The impacts of managing this waste at LANL would be minimal.

Solid nonhazardous waste generated from construction activities to relocate SHEBA and security Category III/IV activities at LANL would be disposed of at the Los Alamos County Landfill located at LANL or its replacement facility within 161 kilometers (100 miles) of LANL after June 30, 2004. Approximately 3.4 cubic meters (4.4 cubic yards) of solid nonhazardous waste would be generated from the construction activities associated with relocating SHEBA activities to LANL's TA-39 (LANL 2001a). This waste represents about 0.06 percent of the current annual solid nonhazardous waste generation rates at LANL (5,453 cubic meters [4,200 cubic yards] per year). The impacts of managing this waste at LANL or off site, would be minimal. Approximately 140 cubic meters (180 cubic yards) of solid nonhazardous waste would be generated from the construction activities associated with relocating security Category III/IV activities to LANL's TA-55 (LANL 2001a). This waste represents about 2.6 percent of the current annual solid nonhazardous waste generation rates at LANL.

Sanitary wastewater generated as a result of construction activities would be managed through the use of portable toilet systems.

Operations Impacts—The impacts of managing waste associated with SHEBA operations and other security Category III/IV activities at LANL would be minimal and are included in the waste generation totals for the LANL New Facility Alternative (see Section 5.2.12) .

5.6.3.13 Transportation

As described in Section 5.2.13 for the TA-18 Upgrade and the LANL New Facility Alternatives, all radioactive material shipments would be conducted within the LANL site. Public risk and accident analyses would not be necessary for the reasons presented in Section 5.2.13. The radiological dose to site workers would include exposure during packaging and loading of radioactive material at TA-18, transport to TA-39, and unloading and unpacking at TA-39. The dose to site workers would be 0.02 person-rem, which corresponds to less than 8×10^{-6} latent cancer fatalities. Dose calculations are described in Appendix D, Section D.7.9.

5.6.3.14 Cumulative Impacts

As discussed in Section 5.2.14, the projected incremental environmental impacts of implementing the proposed action at LANL would not result in additional cumulative impacts. The relocation of SHEBA and other security Category III/IV activities would similarly result in little or no additional cumulative impacts.

5.7 DECONTAMINATION AND DECOMMISSIONING

Decontamination and decommissioning of facilities as a result of the proposed action pertains to two distinct areas: (1) the decontamination and decommissioning of the existing TA-18 facilities if all current missions are relocated, and (2) the decontamination and decommissioning of existing or new relocation facilities at the end of the proposed operations period. At the present time, the ultimate disposition of existing TA-18 facilities, or new facilities constructed to house relocated TA-18 activities, is not known. However, the current condition and contamination history of the existing TA-18 facilities and the projected use of new facilities allows for only a qualitative assessment of the nature and the extent of decontamination required to allow the facilities to be released for unrestricted use.

Decontamination and decommissioning at TA-18 would also involve environmental restoration activities to reduce the long-term public and worker health and safety risks associated with potentially contaminated areas within the site or with surplus facilities and to reduce the risk posed to ecosystems. Decisions regarding whether and how to undertake environmental restoration action would be made after a detailed assessment of the short- and long-term risks and benefits within the framework of RCRA. The approach for controlling the consequences of environmental restoration activities at LANL is summarized in the *LANL SWEIS* (DOE 1999b). Decontamination and decommissioning of TA-18 would involve the general types of activities described and analyzed in the *LANL SWEIS* (e.g., generation of low-level radioactive waste). Specific alternatives to be considered in the decontamination and decommissioning process would likely follow the RCRA framework and would be subject to project-specific NEPA analysis.

5.7.1 Decommissioning Activities Associated with TA-18 Operations

The major TA-18 operations consist of critical assembly experiments involving radioactive materials and SNM composed of enriched uranium-235 and plutonium-239. The potential residual contamination due to facility operations could result from the release of these materials in the building and to the environment. If the residual radioactivity exceeds the specified criteria for release to unrestricted uses, the facility would have to be decontaminated. From TA-18 operations, the major potential decommissioning activities may involve the following:

- Surface contamination on equipment, walls, roof, floors, sinks, laboratory hoods, air ventilation ducts, etc. The contamination surfaces may be removable or fixed.

- Activated contamination within equipment, metals, building materials, walls, and concrete.

- Solid and liquid contaminated waste from normal operations and off-normal and accident events.

- Land contamination from normal operations and off-normal and accident events.

5.7.2 Level of Contamination Associated with TA-18 Operations

Operational experience with TA-18 critical assembly machines has shown that, although some surface contamination may result from the conduct of specific criticality experiments, the nature and magnitude of this contamination is such that it can be easily removed and reduced to acceptable levels. Surface contamination has been maintained below approximately 5,000 disintegrations per minute per square centimeter after postexperiment decontamination.

In contrast to removable surface contamination, contamination associated with neutron activation of materials around the critical assembly and within the CASA cannot be reduced or eliminated without disposing of the object which contains the activation products. This is due to the fact that activation products are produced throughout the material and not just on its surface. Neutron activation occurs when a stable atom absorbs a neutron, which was emitted from the fission process during a criticality experiment, and becomes a radioactive isotope (radioisotope) of that atom. Many radioisotopes emit relatively harmless types of radiation (e.g., alpha or beta rays), low-energy (i.e., less than 0.5 million electron volts) gamma radiation, or have short half-lives (less than one year), which results in a small radiological hazard to workers and the public during decontamination and decommissioning activities.

In accordance with the Low-Level Radioactive Waste Policy Amendments Act of 1985 (42 U.S.C. 2021b), any radioactive waste generated by TA-18 critical assembly machine operation would be classified as low-

level radioactive waste, since it is not high-level radioactive, spent nuclear fuel, or byproduct material as defined by the Atomic Energy Act of 1954.

Previous decontamination and decommissioning experience at nuclear facilities, which involve significant neutron sources, has shown that cobalt-60 is a dominant activation product radioisotope due to the presence of cobalt-59 as an impurity in different steel alloys, its high gamma radiation energy, and its half-life of about 5.3 years. Of the five critical assembly machines at TA-18, only two constitute significant and periodic sources of fission neutrons: Godiva and SHEBA. Experiments with SHEBA have been calculated to result in a larger annual neutron fission source than experiments with Godiva. Using conservative assumptions regarding the magnitude and number of fission experiments conducted with SHEBA and bounding values of cobalt in the stainless steel SHEBA critical assembly vessel (CAV), which houses the fissile material solution for the criticality experiment, a 25-year cobalt-60 activation product volumetric concentration was calculated for the CAV. After 25 years of critical experiments, the SHEBA CAV was calculated to contain approximately 0.01 curies of cobalt-60 per cubic meter, which is much less than the maximum limit of 700 curies per cubic meter for Class A low-level radioactive waste as defined in 10 CFR 61.55 by the U.S. Nuclear Regulatory Commission. This further substantiates that, using the U.S. Nuclear Regulatory Commission criteria, the radioactive activation products from TA-18 critical assembly machines would be only low-level radioactive waste.

Since SHEBA's neutron source bounds all TA-18 machines and the location of the SHEBA CAV represents the closest possible location of any material to fission neutrons, the aforementioned low-level radioactive waste classification of cobalt-60 in the CAV provides technical justification for all materials in and around the critical assembly machines being classified as low-level radioactive waste. Therefore, it is expected that all material in TA-18 or any other location where the TA-18 criticality machines would be relocated would be handled and disposed of as low-level radioactive waste if it has any detectable levels of radiation contamination. The only exception would be the SNM itself. TA-18 critical assembly machines would not generate any high-level radioactive, mixed, or transuranic waste.

5.7.3 Decommissioning Plan

At the end of their use for conducting criticality experiments and related support operations, the TA-18 facilities or the proposed relocation facilities would be subject to the process of decommissioning. The primary decommissioning goal would be for the facility to be decontaminated to the extent that its residual radioactivity is at an acceptable level, thus allowing the land and buildings to be released for unrestricted uses. The facility decontamination would be conducted in a manner to minimize potential impact on health and safety to workers, the general public, and the environment. The facility decontamination would be executed in accordance with the decommissioning plan prepared by the facility operator (a DOE contractor) and approved by DOE.

Prior to the initiation of decommissioning activities, the facility operator would have to prepare a detailed decommissioning plan. The decommissioning plan would contain a detailed description of the site-specific decommissioning activities to be performed and would be sufficient to allow an independent reviewer to assess the appropriateness of the decommissioning activities; the potential impacts on the health and safety of workers, the public, and the environment; and the adequacy of the actions to protect health and safety and the environment. The decommissioning plan would also contain a credible site-specific cost estimate for these actions to allow DOE to allocate adequate funding such that decommissioning activities could be conducted in a timely manner.

5.8 IMPACTS COMMON TO ALL ALTERNATIVES

As previously stated in Chapter 3, impacts from TA-18 nuclear criticality testing operations would not change, regardless of which relocation alternative were implemented. Testing methods and mission operations would not change and, therefore, would not result in any additional impacts. All alternatives would have the same emissions releases, infrastructure requirements, and would generate the same amount of radioactive and nonradioactive waste from TA-18 operations.

One impact that would be common to all alternatives under the proposed action is the one-time generation of approximately 1.5 cubic meters (2 cubic yards) of low-level radioactive and mixed low-level radioactive waste from the refurbishment of the criticality machines currently housed at TA-18. The radioactive waste would consist of old electrical racks, hydraulic systems, control cartridges, and machine stands that would be replaced by new components as part of TA-18 relocation activities. The refurbishment of these criticality machines would occur under any of the proposed alternatives. This waste represents only 0.05 percent of the annual generation rate of LANL's low-level radioactive and mixed low-level radioactive waste and would be treated, stored, and disposed of in accordance with current and developing site practices. The impact of managing this waste at LANL would be minimal (see Section 4.2.12).

Impacts from the relocation of SHEBA would be common to all relocation alternatives. As discussed in Section 5.6, SHEBA and other security Category III/IV activities would remain at LANL, regardless of the relocation alternative implemented as a result of the Record of Decision for this EIS. The relocation of SHEBA to TA-39 and mission activities involving security Category III/IV SNM would result in impacts on the environment due to construction of new buildings and structures at TA-39 and either a new laboratory and office building at TA-55 under the LANL New Facility Alternative or upgrading of existing security Category III/IV facilities at TA-18 under all other relocation alternatives.

5.9 MITIGATION MEASURES

Construction air quality impacts would be mitigated by implementing standard dust-control practices and land reclamation as required by state air quality control agencies. For example, potential mitigation measures to control fugitive dust during construction could include watering of unpaved surfaces; applying nontoxic soil stabilizers to all inactive construction areas; wind fences; covering, watering, or applying nontoxic soil binders to exposed piles of gravel, sand, and dirt; and using electricity from power poles rather than temporary gasoline and diesel power generators. In addition, working controls may also reduce particulate matter concentrations by limiting construction activities to favorable meteorological conditions. Short-term concentrations on public roads from testing of the diesel generators at TA-55, under the LANL New Facility Alternative, would be controlled by appropriate design of the generator stack or other appropriate engineering or management measures. Limitations on testing to favorable meteorological conditions could also be considered by DOE.

5.10 RESOURCE COMMITMENTS

This section describes the unavoidable adverse environmental impacts that could result from the proposed action; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; and irreversible and irretrievable commitments of resources. Unavoidable adverse environmental impacts are impacts that would occur after implementation of all feasible mitigation measures. The relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity addresses issues associated with the condition and maintenance of existing environmental resources used to support the proposed action and the utility of these resources after their use. Resources

that would be irreversibly and irretrievably committed are those that cannot be recovered or recycled and those that are consumed or reduced to unrecoverable forms.

5.10.1 Unavoidable Adverse Environmental Impacts

Implementing any of the alternatives considered in the EIS for the relocation of TA-18 capabilities and materials at LANL would result in unavoidable adverse impacts on the human environment. In general, these impacts are expected to be minimal and would come from incremental impacts attributed to the operations of either existing or upgraded TA-18 facilities at LANL or new facilities for relocated TA-18 capabilities and materials at SNL/NM, NTS, or ANL-W.

Operations at LANL, SNL/NM, NTS, or ANL-W would result in unavoidable radiation exposure to workers and the general public. Workers would be exposed to direct radiation and other chemicals associated with operating the criticality assembly machines. The incremental annual dose contribution from the research, development, design, construction, and application of experiments on nuclear criticality to the maximally exposed offsite individual, general population, and workers is discussed in Sections 5.2.10, 5.3.10, 5.4.10, and 5.5.10.

Also unavoidable would be the generation of very small amounts of fission products, although there is essentially no radioactive waste from normal operations. Any other waste generated during experiments would be collected at the site, treated and/or stored, and eventually removed for suitable recycling or disposal in accordance with applicable EPA regulations.

Operations of upgraded or new facilities at LANL, SNL/NM, NTS, or ANL-W would have minimal unavoidable adverse impacts on air quality. Air quality would be affected by various chemical or radiological constituents in the routine emissions typical of facility operations at these sites, although criticality experiments held at TA-18 do not release significant emissions to the atmosphere at the site. Impacts on air quality at LANL, SNL/NM, NTS, or ANL-W would occur regardless of TA-18 activities. These routine impacts have been addressed in various other NEPA documentation at these sites. The refurbishment of criticality machines associated with TA-18 missions would generate a one-time minimal amount of low-level radioactive waste material that could affect storage requirements. This would be an unavoidable impact on the amount of available and anticipated storage space and the requirements of disposal facilities at LANL.

Also unavoidable would be the temporary construction impacts associated with the upgrade of existing TA-18 facilities or the construction of new facilities to house TA-18 activities at LANL, SNL/NM, NTS, or ANL-W (i.e., fugitive dust and increased construction vehicle traffic).

5.10.2 Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Implementation of the alternatives, including the No Action Alternative, would cause short-term commitments of resources and would permanently commit certain resources (e.g., energy). For each alternative, the short-term use of resources would result in potential long-term benefits to the environment and the enhancement of long-term productivity by decreasing overall health risks to workers, the public, and the surrounding environment by reducing their exposure to hazardous and radioactive substances.

Under the No Action Alternative, environmental resources have already been committed to the operations at the current TA-18 facilities. This commitment would serve to maintain existing environmental conditions with little or no impacts on the long-term productivity of the environment.

Under the proposed action, TA-18 operations would not change; therefore, each of the relocation alternatives would exhibit similar relationships between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, with minimal differences in resource commitments. The short-term use of environmental resources at LANL, SNL/NM, NTS, or ANL-W would be greater than for the No Action Alternative. The short-term commitments of resources would include the space and materials required to construct new facilities, the commitment of new operations support facilities, transportation, and other disposal resources and materials for TA-18 operations. Workers, the public, and the environment would be exposed to increased amounts of hazardous and radioactive materials over the short term from the relocation of TA-18 capabilities and materials, including process emissions and the handling of waste from machine refurbishment. Again, these commitments would be offset by an even greater potential for enhanced long-term viability of the environment than under the No Action Alternative.

Regardless of location, air emissions associated with TA-18 operations would introduce small amounts of radiological and nonradiological constituents to the air of the regions around LANL, SNL/NM, NTS, and ANL-W. Over the 25-year operating period, these emissions would result in additional loading and exposure, but would not impact compliance with air quality or radiation exposure standards at any of these sites. There would be no significant residual environmental effects on long-term environmental viability.

The management and disposal of sanitary solid waste and nonrecyclable radiological waste over the project's life would require a small increase in energy and space at LANL, SNL/NM, NTS, and ANL-W treatment, storage, or disposal facilities or their replacement offsite disposal facilities. Regardless of the location, the land required to meet the solid waste needs would require a long-term commitment of terrestrial resources. Upon the facilities' closures, DOE could decontaminate and decommission the facilities and equipment and restore them to brown-field sites, which could be available for future reuse.

Regardless of location, continued employment, expenditures, and tax revenues generated during the implementation of any of the alternatives would directly benefit the local, regional, and state economies over the short term. Long-term economic productivity could be facilitated by local governments investing project-generated tax revenues into infrastructure and other required services.

The short-term resources to operate TA-18 facilities at either LANL, SNL/NM, NTS, or ANL-W would not affect the long-term productivity of these sites.

5.10.3 Irreversible and Irretrievable Commitments of Resources

Irreversible and irretrievable commitments of resources for each alternative, including the No Action Alternative, potentially would include mineral resources during the life of the project and energy and water used in operating TA-18 facilities. The commitments of capital, energy, labor, and materials during the implementation of the alternatives generally would be irreversible.

Energy expended would be in the form of fuel for equipment and vehicles, electricity for facility operations, and human labor. The energy consumption of facilities to support TA-18 operations would be a small fraction of the total energy used at each DOE site. None of the alternatives evaluated in this EIS would require significantly higher or lower energy consumption. TA-18 operations at any proposed facility would generate nonrecyclable waste steams, such as radiological and nonradiological solid waste and some wastewater. However, certain materials and equipment used during operations of the proposed facilities could be recycled when the facilities are decontaminated and decommissioned.

The implementation of the alternatives considered in this EIS, including the No Action Alternative, would require water, electricity, and diesel fuel. Water at all sites would be obtained from onsite sources.

Electricity and diesel fuel would be purchased from commercial sources. These commodities are readily available and the amounts required would not have an appreciable impact on available supplies or capacities. From a material and energy resource commitment perspective, resource requirements would be minimal.

The disposal of hazardous and/or radioactive waste also would cause irreversible and irretrievable commitments of land, mineral, and energy resources. Hazardous waste and low-level radioactive waste disposal would irreversibly and irretrievably commit land for its disposal. For each of the alternatives analyzed in this document, the No Action Alternative would have the least commitment of land, mineral, and energy resources.